LOWER MAINLAND REFUSE PROJECT

CONCEPTS REPORT

A REPORT ON A VARIETY OF OPTIONS
FOR

SOLID WASTE MANAGEMENT

IN THE
LOWER MAINLAND
OF
BRITISH COLUMBIA

DECEMBER 1984

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A Report to the Political Steering Committee
on
A Variety of Concepts
for
SOLID WASTE MANAGEMENT

December, 1984

FOREWORD

The Lower Mainland area of British Columbia is confronted with the problem of disposing of its solid wastes. The problem is rapidly becoming acute. The municipalities and regional districts decided, in early 1983, with the support of the provinces' Ministry of Environment, to develop a solid waste management plan on a co-operative basis, ignoring all internal jurisdictional boundaries.

The development of this plan is the objective of the Lower Mainland Refuse Project or LMRP. Over the last year many studies have been carried out by officials of the municipalities, regional districts and the federal and provincial governments. Based on these studies a number of systems of handling and disposing of our collected wastes have been devised.

These concepts are presented in this Concepts Report for all concerned to review, discuss and comment on. The most useful form of comment will be written briefs or letters which should be sent to:

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CONCEPTS REPORT

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CHAPTER I - SUMMARY

INTRODUCTION

Every household, commercial establishment and industry in the Lower Mainland of British Columbia disgorges solid wastes in a fairly regular and practically everlasting "garbage stream". This material has to be collected and then disposed of.

Industry is expected to look after its own wastes. Residential and commercial wastes amounted to about one and a quarter million tonnes in 1984. Of this, about 950,000 tonnes are collected by municipalities or private contractors and transported to the various landfills scattered throughout the area.

More and more of the landfills are nearly full and new sites have been sought over the last several years. However, as the population increases and spreads into the more remote areas of the Lower Mainland it is becoming much more difficult to find suitable sites. In addition, people are becoming more sensitive and concerned about environmental and social impacts that arise from traditional "garbage dumps". Many people believe we are being wasteful of our resources and inconsiderate about the effect our solid waste disposal methods will have on nearby residents and future generations. There is a feeling that we should be able to reduce the amount of solid waste we produce, re-use much of what we now throw away, and dispose of what is truly unusable in more technically advanced ways. We as a society are looking for a waste management system which will not pollute or poison our environment, now or in the future.

THE LOWER MAINLAND REFUSE PROJECT

The Lower Mainland area, which is comprised of the Central Fraser Valley, Dewdney-Alouette and Greater Vancouver Regional Districts and their constituent municipalities, decided in 1983 to develop a cooperative Solid Waste Management Plan.

Five major studies have been completed, on landfills, thermal reduction, recycling, economic strategies and transportation. From the data collected in these studies, it is readily apparent that no single method of solid waste disposal accomplishes the purpose of reducing the waste stream to a minimum and disposing of what is of no further use in an acceptable manner.

Thermal reduction, recycling and resource recovery coupled with source reduction, can significantly reduce the amount of unusable waste that must be landfilled. In spite of these efforts, however, there will be a need for new landfills in the near future and a number of landfill sites have been identified.

Based on the five studies, which are available at information centres throughout the Lower Mainland, a number of systems have been conceived. The purpose of this Concepts Report is to present a variety of these possibilities in nine Scenarios, described in Chapter VIII.

It is requested that anyone interested inthe problems of solid waste management write to the Project Manager and give him their though the systems set out in the Scenarios. Other channels of communication will be provided including several "open-house" displays where staff members will be available for discussion and explanation. A conference is planned at which organizations of public interest groups and all levels of government will be invited to make a short presentation of briefs they have submitted.

It is hoped that comments will come from the municipalities and regional districts, the Ministry of Environment, federal agencies, public and private interest groups and individuals.

One point should be clear from the start. Everyone connected with the LMRP is quite aware of the fact that nobody wants a new landfill close to their residence. Repeated statements to this effect contribute nothing to the intelligent consideration of our options at the present stage of the process.

When comments have been received a Draft Solid Waste Management Plan will be prepared for further consideration by the same groups. Finally, when the comments have been received on the Draft, a Recommended Solid Waste Management Plan will be prepared by the LMRP for presentation to the Political Steering Committee and to the Minister of the Environment.

PUBLIC PARTICIPATION IN THE LMRP

From the beginning one of the main intentions of the LMRP has been to involve the public as much as possible in developing the Waste Management Plan. Specific efforts to achieve adequate public participation so far have included:

* establishment of an LMRP office with direct telephone lines (including toll-free long distance);
* a series of 7 "Open House" afternoons and evening meetings to solicit public opinion on what the LMRP should consider in its studies.
* establishment of a policy that all documents used and generated by the LMRP are available for inspection;
* organization of series of workshops for key interest group representatives;
* preparation of a Newsletter to disseminate information presented at the workshops to interested members of the public.

This Concepts Report and the public discussions based on it will be one more step in achieving adequate public participation in the preparation and implementation of a Solid Waste Management Plan for the Lower Mainland.

THE SCENARIOS

The remainder of the chapters which follow this summary describe in more detail the history leading up to our present conditions, what the system is now and the organization and purpose of the LMRP. In Chapter VII certain principles are set out on which to base a waste management plan. Since some of these are debatable, options are suggested.

Chapter VIII itemizes eight possible solutions based on the facts and principles together with comments about the risks of things going wrong and other factors to be considered in making a choice. Capital costs are shown. At the end of that Section is a table showing the financial impact of these different solutions on the basis of the money that would have to be invested today so that at the end of twenty-five years all of it would have been spent and all capital and operating costs in the interim would have been met with no further money furnished. This provides the best basis for comparison but it is important to recognize that no one need raise such and amount at any one time. These "present values" are shown below based on a 5% discount rate.

One scenario is to incinerate everything and the present value of that is 503 million dollars.

One scenario is to have a series of smaller incinerators which in total would burn the great majority of the waste. The present value for that is 310 million dollars.

In both cases the ash would go to Burns Bog. Another scenario takes all the waste unburned to Burns Bog and that would cost 187 million dollars.

The other scenarios use the Burns Bog landfill and one in Langley at one of four sites which have been short-listed (one extends into Matsqui). Options to incinerate some of the waste at a site in Burnaby and at a site in North Vancouver are encompassed. each of these options is within plus or minus 15% of 200 million dollars.

A last scenario is for all wastes to be transported by rail to a mine stie. No costs are available for that Scenario.

It is anticipated that the Concepts Report will be studied by interested parties during December and that the public interface activities can take place through January. It is expected that the Draft Waste Management Plan will be available for discussion shortly after that. After public discussion of the draft plan in February the Recommended Waste Management Plan will be completed in March.

CHAPTER II - INTRODUCTION

1.0 THE CONCEPTS REPORT

The people and industries of the Lower Mainland area produce some one-and-a-quarter million tonnes of solid wastes each year. Of this, about 950,000 tonnes are collected, municipality by municipality, from commercial establishments and homes, usually five days a week, by either municipal employees or by private contractors. Having been collected, it must be disposed of and to this point in time virtually all the waste has been buried in landfills.

Now, however, as the population increases and spreads into the more remote areas of the Lower Mainland it is becoming more difficult to find suitable landfill sites. In addition, people are more concerned about the environmental and social impacts that result from the traditional "garbage dumps". In general, the attitude prevails that we are being wasteful of our resources and inconsiderate of the effect our solid waste disposal methods will have on nearby residents and on future generations. There is a feeling that we should be able to reduce the amount of solid waste we produce, re-use much of what we now throw away, and dispose of what is truly unusable by more technically advanced methods that are not offensive to people now and will not pollute or poison our environment either now, or in the future.

The Waste Management Act of 1982 provides a legislative framework to allow municipalities and regions to plan how they will manage their wastes. When such a plan has been developed, and been submitted to and accepted by the Minister of Environment, it becomes the legally binding method for disposing of wastes in that area.

The Lower Mainland area, which is comprised of the Central Fraser Valley, Dewdney-Alouette and Greater Vancouver Regional Districts and their constituent municipalities, decided in 1983 to develop a co-operative Solid Waste Management Plan. For this purpose the mayors of the municipalities and the regional district chairmen,together with the Fraser River Harbour Commission, formed a Political Steering Committee under the chairmanship of the Minister of Environment. They agreed that jurisdictional boundaries should be ignored in arriving at the best technical solution. The Lower Mainland Refuse Project is being carried out to achieve this objective under the Political Steering Committee's guidance.

Five major studies have been completed, including one on Landfills, one on Thermal Reduction of Waste and one on Recycling and Resource Recovery. These studies showed that no single method of solid waste disposal reduces the waste stream to a minimum and disposes of what is of no further use in a manner acceptable now and in the future. Thermal reduction, resource recovery and recycling, coupled with source reduction, can significantly reduce the amount of unusable waste that must be landfilled but no practical system can reduce the volume by more than 60%.

There will be a need for new landfills in the near future and a number of potentially suitable landfill sites have been identified.

A wide variety of combinations of waste stream reductions, landfill sites and transportation routes and systems can readily be conceived. This Concepts Report sets out a wide selection of these combinations or Scenarios. These Concepts of Lower Mainland Solid Waste Management Plans are presented for comment by governments of all levels, public and private interest groups, related industries and the public at large. When such comments have been received the LMRP will prepare a Draft Solid Waste Management Plan for further consideration by the same groups. Finally when the comments on the Draft have been received a Recommended Solid Waste Management Plan will be prepared by the LMRP for presentation to the Political Steering Committee and subsequently to the Minister of Environment for implementation.

2.0 HISTORY

2.1 Early History of Solid Waste Management in the Lower Mainland

Prior to the 1960's solid waste in the Lower Mainland was a local function that could be managed at disposal sites within each municipality, or through the use of joint disposal sites. By the late 1950's the City of Vancouver recognized that the then existing landfill sites were rapidly being filled while more new sites within City boundaries did not exist. This led the City to undertake extensive searches for landfill sites in other municipalities and also to acquire land for a large incinerator and begin preliminary design of it.

In 1961 the City was successful in purchasing a portion of Burns Bog in the District of Delta and, in 1962, signed an agreement with Delta whereby the city would own and operate a sanitary landfill there. In 1966, Vancouver Landfill operations commenced in Burns Bogbased upon a 20 year agreement with Delta. The agreement was subsequently renegotiated in 1976 for an additional 10 year period extending to 1996.

2.2 Regional Involvement - Early Studies

The provision of regional waste management services in the Lower Mainland dates to 1914, when the Provincial Government created the Joint Sewerage and Drainage Board which originally provided joint sewage and drainage services for the City of Vancouver the municipalities of Burnaby, Point Grey and south Vancouver and later to a portion of New Westminster. In 1956, the Provincial Government repealed the original legislation to create the new Greater Vancouver Sewerage and Drainage District (GVS&DD), which now serves 17 municipalities and cities in the Regional District.

In 1965 the Provincial Government enacted amendments to the

Municipal Act to create 28 Regional Districts which were required by statute to provide for regional land use and hospital planning functions. Responsibility for other services such as water, sewer and solid waste management can be moved by the province from the municipalities to the Regional District on request of the Regional District.

The first involvement by the Greater Vancouver Regional District (GVRD) in solid waste disposal was in 1969 in response to problems facing municipal solid waste disposal operations. After a thorough study the GVRD sought and obtained responsibility for the disposal of solid wastes in 1974. One of its studies was a comprehensive analysis of solid waste transportation and disposal in the region. One recommendation in the report was that sanitary landfills continue as the primary method of solid waste disposal. It recommended that a waste disposal site in Burns Bog be used to accommodate refuse from the southern and western GVRD communities, and that a site be acquired in Surrey Bend to serve the eastern and North Shore municipalities.

In 1974, with the termination of a disposal contract between a privately-owned landfill and the five user municipalities.(Burnaby, Coquitlam, New Westminister, Port Coquitlam and Port Moody) which had looked after their solid wastes for a number of years, the GVRD had to get into active solid waste management. It did so by acquiring the Braid Street site in Coquitlam to serve as a landfill for the eastern GVRD communities. The Braid Street Landfill began operations in 1975, with a projected life span of about 5 years.

Because of the interim nature of the Braid Street Landfill, the GVS & DD proceeded with plans to develop a landfill for the east part of the regional district at the chosen Surrey Bend site. However, the suitability and capacity of this site was reduced significantly by a sizeable expropriation by the CNR. Part of the site was also considered environmentally sensitive by the District of Surrey and several government agencies. In addition, the Provincial Ministry of Environment, Water Management Branch, advised that the at least part of the area was a necessary floodway for the Fraser River and should not be filled.

As a result of this, a report was prepared which reviewed alternative energy and resource recovery systems along with costs and revenues. A major conclusion of the report was that sanitary landfills remained the most economic and technologically feasible method of waste disposal. Concerning incineration, the report noted that the cost was much higher than for landfills, but advised that the GVRD consider constructing a small incinerator to gain experience in what was considered the only practical alternative to landfills.

2.3 GVRD 5 Point Plan

Responding to the above report, the GVRD Solid Waste Committee, in 1981, established a five point plan by which to meet its solid waste disposal responsibilities:

1) enlarge the existing disposal site at Burns Bog to serve the Western sector of the region;
2) develop a refuse disposal site in the eastern area;
3) construct a transfer station at the Braid Street Landfill for bulk haul to other landfills;
4) acquire a site and prepare designs for the building of an incinerator, with energy recovery, and;
5) encourage and promote recycling programs.

The GVRD has been implementing this plan.

2.4 Search for Landfill Sites

During 1981 and 1982, the GVRD investigated three potential landfill sites to serve the eastern municipalities: Langley Peat Bog, Pitt Polder and Texada Island. In each instance the GVRD received strenuous opposition to its proposals, and the viability of establishing a landfill at any of the proposed locations became questionable. In addition, the GVRD's plans to develop a landfill near the existing landfill in Burns Bog received a similar negative response.

By early 1981, the problem of rapidly depleting landfill capacity was also facing communities in the GVRD who disposed of solid wastes in local landfill sites. The estimated capacity of the Port Mann Landfill, serving Surrey, was 5 to 6 years. A portion of the Richmond landfill, on land owned by the Fraser River Harbour Commission, faced imminent closure as part of the owner's port development plans. The Premier Street Landfill, serving North shore communities was facing local opposition to a proposed application for an amendment to its pollution control permit. These three landfills were also creating environmental problems, and were the subject of numerous investigations by federal and provincial regulatory agencies. In the Central Fraser Valley and Dewdney-Alouette Regional Districts municipalities were still able to provide for refuse disposal in small local landfills. It was observed however, that several were approaching their permitted capacities, including the Cottonwood Landfill, serving Maple Ridge and Pitt Meadows, and the Matsqui Landfill. It was also observed that the large population increases and corresponding land development anticipated for these two regional districts was an indication that the volume of solid wastes would grow while the availability of disposal sites would diminish.

3.0 ADVENT OF THE LOWER MAINLAND REFUSE PROJECT

3.1 The Political Steering Committee

By early 1983, the situation regarding solid waste disposal in the three regional districts had become a matter of serious concern to the local, regional and provincial governments. Landfill sites for disposing of refuse from the eastern section had not been located by the GVRD and oppposition to new landfills was loud and widespread. The incineration project was proceeding, with proposals having been received and evaluated, but the volume of refuse to be handled was only 5% of the total generated. Of the eight Lower Mainland Landfill sites, the Port Mann, Cottonwood, Matsqui and Richmond sites were facing imminent capacity problems while the continuance of the Premier Street site beyond its existing permit was being opposed. Charges had either been laid or were being contemplated for the Port Mann, Cottonwood, Richmond and Premier Street operations due to leachate problems.

In a letter dated January 28, 1983, the B.C. Minister of Environment invited the GVRD and the mayors of the constituent municipalities to meet with him to discuss how best to serve the interests of the Lower Mainland in managing solid wastes. There was unanimous agreement among the mayors that the existing solid waste disposal problems called for a comprehensive solution, and it was agreed to convene a meeting in March, 1983.

At this meeting, the Minister suggested to the GVRD mayors and board members that the recently proclaimed Waste Management Act could be the vehicle for a rational solution.

The Waste Management Act, enacted in June of 1982, contains provisions whereby a municipality* can submit a plan to the Minister of Environment for approval, providing for the collection, treatment, handling, storage, utilization and disposal of refuse, sewage and other waste within the whole or a part of the municipality. The Act provides the Lower Mainland Regional Districts the opportunity to initiate a regional or inter-regional solid waste management strategy that could replace the existing system of pollution control permits. The boundaries of the area in such a plan are flexible and could include one or more Regional Districts or portions thereof. The Waste Management Act therefore offers a legal framework in which the Lower Mainland municipalities can voluntarily agree to develop a collective solid waste disposal plan that, when approved by the Minister of Environment, would have the force of law.

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*In the Waste Management Act, municipality means a city, town or village incorporated by or under the Act, including a district municipality, regional district, improvement district and the Greater Vancouver Sewerage and Drainage District.

3.2 The Co-operation Agreement

All mayors present at the March, 1983 meeting agreed that the preparation of a Solid Waste Management Plan would be a positive response to existing refuse disposal problems. It was decided to initiate the process of developing such a plan by establishing a Political Steering Committee (PSC) comprised of all Mayors in the GVS&DD, including the GVRD Board Chairman, and the Minister of Environment. Shortly thereafter, the boundaries of the area entering into the Waste Management Plan process were expanded to include the Central Fraser Valley Regional District (CFVRD) and Dewdney-Alouette Regional District (DARD). The mayors of the member municipalities and the Chairmen of the Regional District Boards as well as a representative of the Fraser River Harbour Commission were added to the PSC. As recommended by the Minister of Environment, it was agreed to ignore local political boundaries during the preparation of the Solid Waste Management Plan. In general it was further agreed that municipalities would not apply for new or amended pollution control permits while preparation of the plan was in progress.

The PSC appointed an Administrative Committee chaired by the Deputy Minister of the Environment and comprising as well the three Regional District Administrators. This Committee was directed to prepare Terms of Reference for developing the plan.

As an immediate action the Administrative Committee established a Technical Sub-committee to find a solution to the imminent closure of Braid Street Landfill.

The Technical Sub-committee recommended that the Braid Street Landfill be closed and that the Premier Street, Burns Bog and Port Mann Landfills accept a proportion of the resulting refuse on an interim basis. The GVRD, City of Vancouver and District of Delta finally agreed that refuse from the Braid Street site would be conveyed to Burns Bog from October 11,
1983 to October 31, 1986. The choice of a three year contractual arrangement was based on the estimated time required to prepare and implement the proposed Solid Waste Management Plan. As part of this agreement, the GVRD agreed to not place refuse from the eastern communities in Burns Bog without permission from Vancouver and Delta.

3.3 Organization of the Lower Mainland Refuse Project

The Administrative committee decided that a Project Manager should be engaged to direct the development of the Solid Waste Management Plan. Terms of Reference were prepared and after a search a contract was signed with Mr. Keith A. Henry, P. Eng., Consultant. The effective date of the contract was October 1, 1983.

The name of the committee was changed to the Management Committee and the membership was increased to include additional senior municipal personnel.

The Management Committee decided that the three-year period assumed by the Political Steering Committee should consist of a Planning Phase lasting one year and an Implementation Phase of two years. An amount of $250,000 was budgeted for the Planning Phase.

At the end of October 1983 the Project Manager presented to the committee a draft schedule and outline of work to be performed. He estimated that about 100 man-months would be required and that the cost of this would be at least $750,000 if consultants were used. He recommended that because the Planning Phase was closely connected to the work of the regional districts and municipalities and the Ministry of Environment the work be carried out by the staff of those bodies under his co-ordination. It was recognizeed that this would not actually save money but that it could be done with already committed funds. It was also considered to be an effective way of obtaining full co-operation from the municipalities', ministries' and regional districts' staffs as well as being the most efficient way of getting to the access large amounts of data they had already accumulated. This procedure was agreed upon and later blessed by the PSC. Subsequently personnel from Environment Canada's Environmental Protection Services joined many committees and made material contributions. The process has worked extraordinarily well to the present time. Its success has been due to the very great efforts of all taking part.

An important feature of this co-operation effort has been the ability of the participants to follow the request of the Project Manager that they bring their expertise to the tasks and leave behind the special and particular concerns of their municipalities.

The efforts were carried out through eleven Working Committees organized to address the various components such as landfills, incineration, recycling, economic strategies and many others.

3.4 Public Participation in the Planning Phase

As part of the discussion leading to his appointment, the Project Manager emphasized the necessity for providing for full public participation to the extent possible in all aspects of the Planning Phase. Section 16(2) of the Waste Management Act states that the Minister of Environment may approve a Waste Management Plan where the minister considers there has been adequate public consultation during preparation of the plan. Throughout the work on the LMRP up to the preparation of this Concepts Report, it has been a main objective to achieve as much public participation as possible. This effort will continue throughout the remainder of the Planning Phase.

Specific efforts to achieve adequate public participation have included:

- establishment of an LMRP office with direct telephone lines (including toll-free long distance) continuously manned by staff competent to deal with questions and to respond to request for written information.
- Opening of fourteen other information centres where much of the material developed is available.
- A series of seven well-advertised "open-house" afternoons and evening meetings to solicit public opinion on what the LMRP should consider in its studies. These were held at an early stage of the project so that this information would be available to the working committees early in their deliberations.
- Establishment of a policy that all documents used and generated by the LMRP are available for inspection.
- Initiation of activities to identify key interest groups and bring them into the planning process.
- Organization of a series of workshops for key interest group representatives to keep them apprised of the progress of the working committees.
- Inclusion of interest group members on the working committees themselves.
- Preparation of a newsletter to give wider dissemination to information presented at the workshops and available to the working committee members. These newsletters also contained some of the opinions of the interest group representatives.
- Establishment of a mailing list of interested persons through whom newsletters and other pertinent information can be disseminated.
- Appearances on television and radio and interviews with the press to publicize the processes of the Planning Phase.

Approximately 50% of the budget of the LMRP is devoted to these activities related to interfacing with the public. A consulting firm specializing in public participation has given professional advice to the Project Manager throughout the studies and has carried out a number of special studies. This firm, Connor Development Services Ltd., has carried out many of the activities such as publishing the newsletters, arranging and running workshops and open-houses and determining social profiles in the regions.

This Concepts Report and the public discussions which will be based on it are one more step in achieving adequate public participation in the preparation and implementation of a Solid Waste Management Plan for the Lower Mainland.

CHAPTER III - OBJECTIVES

1. The Lower Mainland Refuse Project

The overall objective of the project is to devise a solid waste management plan that will guide the development of methods of disposal and the operation of a system for handling the area's solid wastes for at least fifteen and hopefully fifty years.

Such a plan must be flexible and will have to be reviewed regularly. Technical advances will occur. Population will change and centers of concentration may move. Other economic factors such as costs of energy and transportation will influence methods of disposal. The value of some materials may change to make their recovery economically attractive. It is to be hoped that social pressures will be developed through education that will cause major reductions of waste generation in such areas as packaging and display. This will come about through a change in people's attitudes and perceptions and through increased environmental concerns.

The solid waste management plan we devise now has to specify what we do in the next few years and provide an outline for the next generation. It must also contain mechanisms for review and modification in light of changing conditions.

1.1 Development of a Solid Waste Management Plan

To produce the Solid Waste Management Plan, certain steps are required:

1.1.1 The present system of waste disposal must be examined and analysed.

1.1.2 The waste generated must be identified as to volume and location.

1.1.3 A study of waste reduction possibilities is needed.

1.1.4 Alternative disposal methods need investigation and their social acceptability must be determined.

1.1.5 Costs of the various components need to be estimated.

1.1.6 Implications of economic incentives, disincentives and market conditions must be considered.

1.1.7 A variety of concepts of systems for waste disposal must be developed.

1.1.8 The concepts must be evaluated and the best system chosen.

At every step in this process the participation of the public must be solicited.

1.2 Development of Public Participation

A solid waste disposal system gets very little public attention as long as it is working well. However, if a population begins to encroach on the buffer zone surrounding a landfill, if a landfill becomes unsightly or odorous, if groundwater or surface water pollution is suspected, if an incinerator emits odorous or harmful gases, or if a new landfill site is proposed and new haulways become necessary then public concerns instantly become very intense in the areas affected.

The Lower Mainland Refuse Project Team (LMRP) recognized from the start that strong technical arguments had been advanced for the opening of a new sanitary landfill. However, it was also recognized that many people thought alternatives might be adopted which would make this unnecessary. The basic concept of the project was to generate public participation in determining what options were practically available and to solicit public opinion at every step. To achieve this objective the following actions were taken:

1.2.1 Upon appointment of the Project Manager a press release was issued by the Minister of Environment announcing and describing the project (Sept 27, 1983).

1.2.2 As soon as an organization could be devised, a series of open-houses and public meetings were held. These were designed to solicit public comment on the solid waste disposal problem. They were also meant to raise the issue in the public view.

1.2.3 A series of workshops were held for some twenty representatives of public and private interest groups to disseminate information about the work of the project.

1.2.4 A newsletter was published after each workshop to further spread information on the project.

1.2.5 A number of people from private and public interest groups were appointed to various working committees of the project.

1.2.6 All minutes, records, reports and correspondence of the project, were made available for inspection.

1.2.7 Fourteen information centers were maintained throughout the project area where reports and newsletters are available.

2.0 The Concepts Report

The LMRP team has produced and published three basic reports on, resource recovery and recycling, thermal reduction and landfills. In addition reports on economic strategies and transportation and transfer stations have built on this basic data. This Concepts Report is based on those documents and on the public's comments as received at the workshops. The first objective of the Concepts Report is to present as clearly as possible a number of alternative systems that may be utilized in the handling of the area's solid wastes.

A second objective is to present as much information about costs and benefits as possible to make comparison of the different concepts meaningful.

A third objective is to solicit public and private responses to the various alternatives so that the LMRP can incorporate them in their deliberations.

Several Open-houses and a conference will be arranged to facilitate comments and suggestions. Written briefs are welcomed from everyone. It is hoped that governmental agencies will respond to the ideas set out in this Concepts Report.

CHAPTER IV - PRESENT DISPOSAL SYSTEM

The solid wastes generated in the Lower Mainland area are collected by a large number of organizations. Some municipalities own and operate their own vehicles and containers. Others have contracted out this work. The commercial waste from office buildings, hotels and restaurants is practically all handled by companies specializing in this type of work. Industrial wastes are the responsibility of the industry who also contract the work to specialists although some is done by the industries themselves. Table I shows the landfill sites used by the municipalities in the lower mainland area along with the annual tonnage of waste disposed of at each site.

In general the waste is transported to the disposal facility by the collectors. One major exception is the waste from New Westminster, Burnaby, Coquitlam, Port Coquitlam and Port Moody which, since the closure of the Braid Street Landfill in Coquitlam in October 1983, is taken to a transfer station near the Braid Street site. There it is transferred to large tandem haulers and transported to the Burns Bog Landfill.

At present, landfills are the only significant form of solid waste disposal in the Lower Mainland. They receive about 950,000 tonnes per year. In addition an unknown quantity of yard debris and organic wastes are converted to humus in backyard compost piles, and several municipalities conduct composting and mulching programs for leaves and prunings from parks and boulevards. A substantial volume of potential waste material is recycled through the efforts of non-profit and private recycling operations. The volume estimated by the Resource Recovery and Recycling Committee is 68,000 tonnes per year, comprised mainly of corrugated paper, old news-paper and glass.

Other materials are diverted prior to entering the waste stream. Figuring prominently in this category are used oil (8,000 tonnes per year), tires (4,000 tonnes per year) and scrap metal (100,000 tonnes per year), glass (95,000 tonnes per year.

Together waste recycling and recovery activities significantly reduce solid waste disposal requirements by diverting almost 300,000 tonnes per year of refuse from landfills.

The arrangements for collection and disposal of solid waste are not rigid and many variations occur. Because the tipping fee (the charge made by landfill operators for waste disposal at their facilities) is not the same at all landfills private operators frequently carry wastes from one jurisdiction to another. Haul distances also cause diversions. Operators are in the business to make money and try to develop the most economical combination of haul routes and tipping fees in order to be competitive.

For these reasons there are overlaps in many of the disposal patterns shown in Table I below. They also change frequently as tipping fees change and therefore the descriptions cannot be more than approximate. Nevertheless, the patterns are generally correct and sufficient for purposes of analysis and planning.

TABLE I

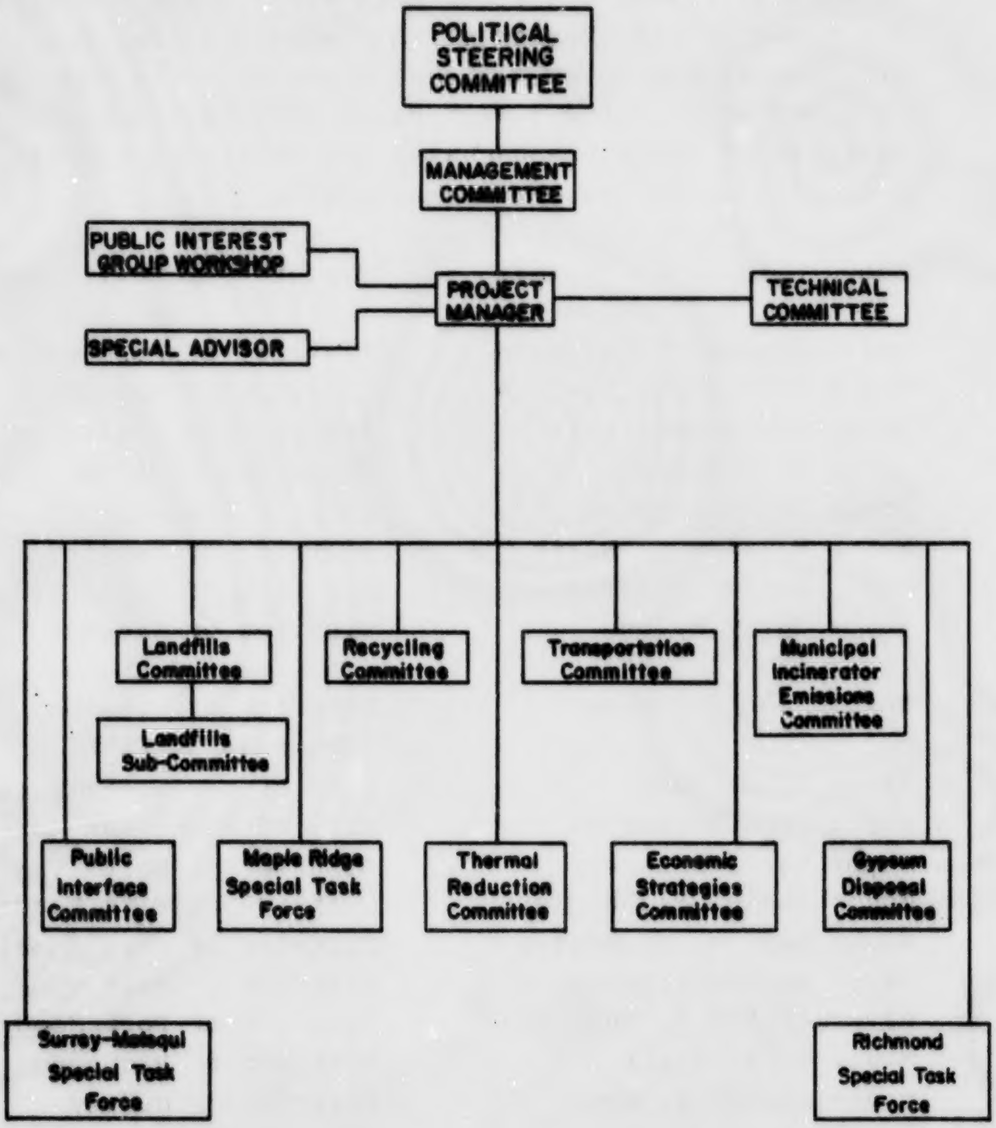
1982 REFUSE TONNAGE

Landfill	Tonnes/Year	Jurisdiction(s) Served
Burns Bog*	480,900	Belcarra, Burnaby, Coquitlam, Delta, New Westminster, Port Coquitlam, Port Moody, Vancouver, White Rock, UBC-UEL
Richmond	170,200	Richmond, Other Areas?
Premier Street	118,400	Lions Bay, North Vancouver City & District, West Vancouver, Bowen Island
Port Mann	76,500	Surrey
Tretheway Pit	25,500	Abbotsford, Matsqui
Cottonwood	24,000	Maple Ridge, Pitt Meadows
Jackman Pit	21,800	Langley City and District
Minnie's Pit	14,500	Mission
Total	931,800	

* About 30% of this is refuse that was previously disposed of at the now closed Braid Street Landfill.

CHAPTER V ORGANIZATION OF THE LOWER MAINLAND REFUSE PROJECT

ORGANIZATIONAL CHART


POLITICAL STEERING COMMITTEE
MANAGEMENT COMMITTEE
PUBLIC INTEREST GROUP WORKSHOP
PROJECT MANAGER
TECHNICAL COMMITTEE
SPECIAL ADVISOR
Landfills Committee
Landfills Sub-Committee
Recycling Committee
Transportation Committee
Municipal Incinerator Emissions Committee
Public Interface Committee
Maple Ridge Special Task Force
Thermal Reduction Committee
Economic Strategies Committee
Gypsum Disposal Committee
Surrey-Matsqui Special Task Force
Richmond Special Task Force

CHAPTER V

1. The Political Steering Committee

The Political Steering Committee is a voluntary grouping of the mayors and regional district board chairmen from municipalities in the Lower Mainland. These municipalities are those within the Dewdney-Alouette, Central Fraser Valley and Greater Vancouver Regional Districts. In addition there is a member from the Fraser River Harbour Commission. The Minister of Environment chairs the Political Steering Committee. The present membership is:

Honourable A. J. Brummet (Chairman)	Minister of Environment
Mayor George F. Ferguson	District of Abbotsford
Mayor William A. Lewarne	District of Burnaby
Mayor Louis Sekora	District of Coquitlam
Mayor E. Burnett	District of Delta
Mayor R. Easingwood	City of Langley
Mayor William C. Blair	District of Langley
Mayor Daniel Griffin	District of Maple Ridge
Mayor Harry DeJong	District of Matsqui (Chairman of CFVRD)
Mayor John J. Agnew	District of Mission (Chairman of DARD)
Mayor T. C. Baker	City of New Westminster
Mayor John E. Loucks	City of North Vancouver
Mayor Marilyn Baker	District of North Vancouver
Mayor Daniel R. Sharpe	District of Pitt Meadows
Mayor Len. M. Traboulay	District of Port Coquitlam
Mayor David Driscoll	District of Port Moody
Alderman Ann C. Hulbert	District of Port Moody
Mayor G. J. Blair	District of Richmond
Mayor Donald A. Ross	District of Surrey (Chairman of GVRD)
Mayor Michael F. Harcourt	City of Vancouver
Mayor D. Humphreys	District of West Vancouver
Mayor Gordon J. Hogg	District of White Rock
Mr. Scott McLaren	Fraser River Harbour Commission

2. The Management Committee

The Political Steering Committee appointed a Management Committee from the senior staff members of the municipalities and the regional districts. This Committee is chaired by the Deputy Minister of Environment. The present membership is:

Mr. B. Marr, Chairman	Deputy Minister of Environment
Mr. F. Bowers	Manager, City of Vancouver
Mr. J. Bremner	Municipal Engineer, District of North Vancouver
Mr. R. Collier	Administrator, District of Delta
Dr. N. Cook	Administrator, Dewdney-Alouette Regional District
Mr. J. Godfrey	Administrator, Township of Langley
Mr. G. Harkness	Assistant Deputy Minister, Ministry of Municipal Affairs
Mr. H. Harnett	Administrator, District of Mission
Mr. M. Jones	Manager, District of Surrey
Mr. D. MacKay	Commissioner, Greater Vancouver Regional District
Mr. H. Porter	Administrator, Central Fraser Valley Regional District
Mr. E. Regts	Municipal Engineer, District of Matsqui
Mr. J. Sulina	Administrator, District of Maple Ridge

3. The Project Manager

The Management Committee decided that to carry out the project it would be necessary to have a full-time manager. The Executive developed a list of candidates whom they interviewed.

They selected Mr. Keith A. Henry, P. Eng., Consultant Mr. Henry was given brief terms of reference and a modest budget. He was also given the assistance of whomever he might call on from the staffs of the municipalities, regional districts and the Ministry of Environment. In addition assistance was made available by the Ministries of Health, Municipal Affairs and the Environmental Protection Service of Environment Canada.

4. The Technical Committee

The Project Manager set up a committee of advisors to himself called the Technical Committee which he chairs. The membership consisted of:

Mr. Keith A. Henry, Chairman	Lower Mainland Refuse Project
Mr. D. Walker	Director of Operations, District of West Vancouver
Mr. R. Smith	Public Health Inspector B.C. Ministry of Health
Mr. D. Rudberg	Deputy City Engineer, City of Vancouver
Mr. E. Regts	Municipal Engineer, District of Matsqui
Mr. A. Purdon	Chief Engineer, Greater Vancouver Sewage & Drainage District
Mr. F. E. Peters	City Engineer, City of Port Coquitlam
Mr. N. Nyberg	Municipal Engineer, District of Coquitlam
Mr. W. Mechler	Senior Assistant Engineer, Greater Vancouver Sewerage & Drainage District
Mr. W. Kyle	Municipal Engineer, District of Surrey
Mr. P. Khare	Ministry of Environment, Surrey
Mr. J. Hamilton	Director/Engineering Services District of Delta

Ms. E. Feller	Acting Executive Director, Society Promoting Environmental Conservation
J. E. Dew-Jones	Manager, Resource Recovery Branch, Ministry of Environment
P. Connolly	Municipal Engineer, District of Mission
F. Claggett	Manager, Pollution Control, Environmental Protection Services
W. Brydon	Executive Director, B. C. Public Interest Research Group
J. Bremner	Municipal Engineer, District of North Vancouver

The Political Steering Committee decided that the members of the Technical Committee should serve in their professional capacities and not as representatives of their various jurisdictions. this they did very faithfully and all are to be highly commended for the impartiality their advice to the Project Manager.

5. The Working Committee

The Project Manager organized the project in accordance with certain subjects that needed to be reviewed and reported on. These Committees were:

Name of Committee	Chairman
Landfills	Mr. E. J. Bremner
Thermal Reduction	Mr. W. A. Mechler
Resource Recovery and Recycling	Mr. F. E. Peters
Economic Strategies	Mr. N. W. Nyberg
Transfer Stations & Transportation	Mr. P. A. Connolly
Public Interface	Mr. K. A. Henry

Several problems requiring immediate resolution arose during the course of the work and for these Special Task Forces were set up. These were:

Maple Ridge	Mr. D. R. Walker
Matsqui & Surrey	Mr. D. R. Walker
Richmond	Mr. J. Hamilton
Gypsum	Mr. D. Rudberg
Municipal Incinerator Emissions	Mr. P. Khare

Along with the Project Manager, Mr. K. A. Henry and his Special Advisor, Dr. R. D. Cameron, well over one hundred and twenty-five people were involved in the work of the committees and special task forces. Appendix A to this report indicates the membership of each committee and gives one-sentence summary of their terms of reference.

CHAPTER VI THE STUDIES

1.0 Introduction

The studies carried out by the various committees described in Chapter V were not all done simultaneously. Three committees, Landfills, Thermal Reduction and Resource Recovery and Recycling commenced their work in November, 1983 and completed their reports at the end of June 1984. However, the Economic Strategies Committee and the Transportation and Transfer Stations Committee were only able to do some preparatory and planning work before they received these reports. They then carried out their studies, co-ordinated by the Concept Plan Committee, coming up with the basis for the Scenarios described in Chapter VIII of this report.

Three Special Task Forces dealt with immediate problems that arose from time to time, first in Maple Ridge, then in Matsqui and Surrey and finally at the Richmond Landfill site. They reported separately and their reports are available for inspection and review. These interim solutions will be superseded by the waste management plan.

The Gypsum Committee, appointed to investigate the disposal of this troublesome material, has done a study in a manner similar to the Special Task Forces and the results will form a part of the Waste Management Plan. They indicate the way in which gypsum is to be handled throughout the study area.
The Public Interface Committee was an advisory group to the Project Manager. They carried out studies on the public involvement and sociological aspects of the projects. Their reports are available for inspection and review.

This Chapter of the Concepts Report consists of summaries of the committee reports on Landfills, Thermal Reduction, and Resource Recovery and Recycling, preceded by the basic population and refuse statistics and predictions upon which the the studies are based. These summaries are accepted as providing the basis for developing alternative concepts, although some matters are further addressed in Chapter VII.

2.0 Basic Data

Table II shows the 1981 population and the 1982 tonnages of refuse from the various municipalities and regional districts of the Lower Mainland Area. From these are developed rates of long term annual waste generation. Population predictions for each five-year period to 2011 are accompanied by predictions of annual waste generation.

3.0 Summary of the Landfills Report

3.1 Historically landfills have been an integral part of municipal solid waste plans, and will continue to be so for the foreseeable future even though efforts are being made and will be intensified to reduce the volume and weight of material going in to them. Recognizing this fact, a working committee was appointed to investigate and identify potential landfill sites, which could be utilized by the municipalities within the Greater Vancouver, Dewdney Alouette and Central Fraser Valley Regional Districts. The working committee appointed was a multi-disciplinary team including members from all levels of government and from public interest groups.

3.2 The Committee's objectives, in addition to identifying potential sites and the costs related thereto, were to describe past problems with landfill disposal and illustrate ways these problems could be mitigated in a model landfill operation.

3.3 The Committee approached their task of identifying potential sites by first eliminating from consideration those lands which by reason of either their existing or proposed use, or their uniqueness of flora and fauna, would preclude their use as a site for a landfill. The following primary constraints were identified on a series of overlay maps:

TABLE II - FUTURE POPULATION AND REFUSE TONNAGES

		CITY - DISTRICT	POPULATION 1981	1982 TONNAGES		LONG TERM ANNUAL WASTE GENERATION		1986		1991		1996		2001		2006		2011	
				TONNES(2)	kg(6)/CAPITA	kg/CAPITA	lb/CAPITA	POPULATION	TONNES	POPULATION	TONNES	POPULATION	TONNES	POPULATION	TONNES	POPULATION	TONNES	POPULATION	TONNES
GVRD	1	WEST VANCOUVER	35 728	26 800	750	850	1 875	36 000	30 600	36 000	30 600	36 000	30 600	36 000	30 600	36 000	30 600	36 000	30 600
	2	NORTH VANCOUVER	65 367	52 500	806	850	1 875	67 500	57 400	68 500	58 200	71 500	60 800	72 500	61 600	73 500	62 500	74 500	63 300
	3	NORTH VANCOUVER - CITY	33 952	39 100	1 150	850	1 875	34 000	28 900	35 000	29 800	36 000	30 600	36 000	30 600	36 000	30 600	36 000	30 600
		NORTH SHORE (1 TO 3)(1)	137 250	118 400	860	850	1 875	137 500	116 900	139 500	118 600	143 500	122 000	144 500	122 800	145 500	123 700	146 500	124 500
	4	BURNABY	136 484	255 400	920	700	1 545	138 000	96 600	138 500	96 900	139 000	97 300	141 500	99 100	140 500	98 300	140 500	98 300
	5	COQUITLAM	61 077			700	1 545	65 500	45 900	71 000	49 700	76 000	53 200	79 500	55 600	83 000	58 100	86 500	60 500
	6	NEW WESTMINSTER	38 550			700	1 545	39 000	27 300	39 000	27 300	40 000	28 000	40 000	28 000	40 000	28 000	40 000	28 000
	7	PORT MOODY	14 917			700	1 545	18 500	12 900	22 000	15 400	26 000	18 200	30 500	21 300	35 000	24 500	40 000	28 000
	8	PORT COQUITLAM	27 535			700	1 545	31 000	21 700	35 000	24 500	39 000	27 300	43 000	30 100	46 500	32 500	50 000	35 000
	9	VANCOUVER	414 281	214 600	520	700	1 545	414 300	290 000	413 300	289 300	414 800	290 400	414 300	290 000	403 800	282 700	403 800	282 700
	10	UBC - UEL	3 674	10 900	2 970	700	1 545	3 700	2 600	3 700	2 600	3 700	2 600	3 700	2 600	3 700	2 600	3 700	2 600
		(1)BURNABY PENINSULA (4 TO 10)	697 793	480 900	690	700	1 545	711 400	498 000	723 900	506 700	739 900	518 000	753 900	527 700	753 900	527 700	765 900	536 100
	11	RICHMOND	96 154	124 700	1 300	700	1 545	110 500	77 400	121 500	85 000	131 500	92 100	136 000	95 200	142 500	99 800	150 000	105 000
	12	DELTA	74 692	38 500	520	700	1 545	81 000	56 700	88 500	62 000	95 000	66 500	96 500	67 600	97 000	67 900	98 000	68 600
	13	WHITE ROCK	13 550	7 000	520	700	1 545	14 500	10 200	14 500	10 200	15 000	10 500	15 000	10 500	15 000	10 500	15 000	10 500
		SOUTH WEST (11 TO 13)(1)	184 496	170 200	920	700	1 545	206 100	144 300	224 600	157 200	241 600	169 100	247 600	173 300	254 600	178 200	263 100	184 200
	14	SURREY	147 138	76 500	520	700	1 545	173 500	104 100(3)	206 000	144 200	243 000	170 100	271 000	189 700	301 500	211 100	330 000	231 000
		SUBTOTAL (9 TO 13)	602 351	385 700	640	700	1 545	624 100	436 900	641 600	449 100	660 100	462 100	665 600	465 900	662 100	463 500	670 600	469 500
		SUBTOTAL (1 TO 8 & 14)(1)	564 326	450 300	800	-	-	604 800	426 600	652 400	477 600	708 300	517 300	751 400	547 700	793 000	577 500	834 900	606 300
		* TOTAL GVRD (1 TO 14)(1)	1 166 677	846 000	730	-	-	1228 900	863 500	1294 000	926 700	1368 400	979 400	1417 000	1013600	1455000	1041 000	1505 500	1075 800
CFVRD	15	LANGLEY	44 617	21 800	360	675	1 490	56 800	27 000(4)	68 700	39 500(4)	80 800	54 500	92 800	62 600	104 900	70 800	116 900	78 900
	16	LANGLEY - CITY	15 124			675	1 490	18 300	8 700(4)	22 100	12 700(4)	26 000	17 600	29 900	20 200	33 600	22 800	37 700	25 400
	17	MATSQUI	42 001	25 500	470	675	1 490	53 800	25 600(4)	65 200	37 500(4)	76 600	51 700	88 000	59 400	99 400	67 100	110 800	74 800
	18	ABBOTSFORD	12 745			675	1 490	15 700	7 500(4)	19 000	10 900(4)	22 300	15 100	25 600	17 300	28 900	19 500	32 200	21 700
		* TOTAL CFVRD(1) (15 TO 18)	114 793	47 300	410	675	1 490	144 900	68 800(4)	175 500	100 900(4)	206 200	139 200	236 900	159 900	267 700	180 700	298 400	201 400
		SURREY & CFVRD(1) (14 TO 18)	261 931	123 800	470	-	-	318 400	172 900	381 500	245 100	449 200	309 300	507 900	349 600	569 200	391 800	628 400	432 400
DARD	19	MAPLE RIDGE	32 232	24 000	620	675	1 490	35 200	22 900(5)	38 100	25 700	40 900	27 600	43 800	29 600	46 600	31 500	49 500	33 400
	20	PITT MEADOWS	6 209			675	1 490	7 900	5 100(5)	9 600	6 500	11 200	7 600	12 700	8 600	14 100	9 500	15 400	10 400
	21	MISSION	20 056	14 500	720	675	1 490	25 400	16 500(5)	30 800	20 800	36 000	24 300	41 200	27 800	46 400	31 300	51 600	34 800
		* TOTAL DARD(1) (19 TO 21)	61 613	38 500	620	675	1 490	72 300	47 000(5)	82 600	55 800	92 500	62 400	102 500	69 200	112 200	75 700	122 000	82 400
		LOWER MAINLAND TOTAL(1) (1 TO 21)	1 343 083	931 800	690	-	-	1446 100	979 300	1562 100	1 083 400	1667 100	1181 000	1756 400	1242 700	1835 800	1297 400	1925 900	1359 600

NOTES:
(1) POPULATION TOTALS AND SUBTOTALS INCLUDE ELECTORAL AREAS
(2) ROUNDED TO NEAREST HUNDRED TONNES
(3) 600 kg/CAPITA USED FOR 1986; 700 kg/CAPITA FOR 1991 AND LATER
(4) 475 kg/CAPITA FOR 1986, 575 kg/CAPITA FOR 1991; 675 kg/CAPITA FOR 1996 AND LATER
(5) 650 kg/CAPITA FOR 1986; 675 kg/CAPITA FOR 1991 AND LATER
(6) THE KILOGRAMS PER CAPITA FOR 1982 MAY NOT BE INDICATIVE OF THE TOTAL WASTE GENERATED IN THE INDIVIDUAL MUNICIPALITY DUE TO VARIOUS FACTORS

- existing and future development;
- fish and wildlife habitat;
- areas of high agricultural suitability and use.

These maps were not included in the report because of their very large size, but are available for review.

3.4 This process identified 14 sites which were deemed to warrant closer inspection as potential landfill sites.

3.5 Following aerial and ground inspections of each of these 14 sites a list of criteria was established for the purpose of ranking the sites. The initial selection of these criteria was based on a review of methodologies that have been used elsewhere for site selection and for assessment of environmental impacts. These criteria were grouped into four categories: physical, biological, land use and social. Each category was further divided into a number of weighted factors. The results of the rating are presented on the evaluation matrix Figure I.

3.6 The six top-ranked sites identified were:

Site No. 1 - Burns Bog - Delta
Site No. 2 - Border Gravel - Langley
Site No. 4 - Matsqui Gravel - Matsqui & Langley
Site No. 5 - Langley Peat
Site No. 11 - County Line - Langley
Site No. 14 - Maple Ridge PVI

and are shown on Figure II.

Site No. 14 - Maple Ridge PVI, received a high ranking, but because of its limited size was not considered suitable as a Regional Landfill site. However, it was considered to merit further consideration as a local site for the municipalities of Pitt Meadows and Maple Ridge.

LOWER MAINLAND REFUSE PROJECT

LANDFILL SITE EVALUATION MATRIX

SITE RATINGS

	FACTOR	WEIGHT	FACTOR COMPONENTS	SITE No. 1 BURNS BOG DELTA		SITE No. 2 BORDER GRAVEL - LANGLEY		SITE No. 3 PACIFIC HIGHWAY		(2) SITE No. 4 SURREY BIG BEND		SITE No. 5 LANGLEY PEAT		SITE No. 6 SURREY GRAVEL		(2) SITE No. 7 MATSQUI GRAVEL		SITE No. 8 GLEN VALLEY-MATSQUI		SITE No. 9 CFS ALDERGROVE		SITE No. GLOUCESTER - LANGLEY
				Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points
PHYSICAL 20%	GEOLOGY	3	stability soil type seismicity	1.75	5.3	3.38	10.1	2.0	6.0	1.75	5.3	1.86	5.6	3.75	11.3	3.63	10.9	3.0	9.0	2.25	6.8	2.13
	TOPOGRAPHY	2	slope	1	2.0	2.75	5.5	1.57	3.1	1.13	2.3	1.0	2.0	1.25	2.5	1.5	3.0	1.0	2.0	1.25	2.5	1.5
	GROUNDWATER	9	depth flow direction use	2.25	20.3	3.75	33.8	3.00	27.0	2.13	19.2	2.29	20.6	4.38	39.4	3.88	34.9	3.0	27.0	2.75	24.8	2.88
	SURFACE WATER	4	flooding potential flow direction use	2.5	10.0	2.5	10.0	3.14	12.6	3.5	14.0	2.71	10.8	2.88	11.5	1.88	7.5	2.75	11.0	2.63	10.5	2.25
	CLIMATE	2	precipitation	2.13	4.3	2.0	4.0	2.29	4.6	2.88	5.8	3.14	6.3	2.13	4.3	2.13	4.3	3.0	6.0	2.25	4.5	2.38
	TOTAL PHYSICAL				41.9		63.4		53.3		46.6		45.3		69.0		60.6		55.0		49.1	
BIOLOGICAL 25%	FISHERIES	13	diversity abundance habitat aquatic	1.83	23.8	2.5	32.5	2.0	26.0	3.67	47.7	2.17	28.2	4.17	54.2	2.17	28.2	2.33	30.3	2.67	34.7	2.67
	WILDLIFE	12	diversity abundance habitat aquatic	3.17	38.0	1.5	18.0	1.83	22.0	4.33	52.0	2.17	26.0	1.83	22	1.67	20.0	2.83	34.0	2.5	30.0	2.33
	TOTAL BIOLOGICAL				61.8		50.5		48.0		99.7		54.2		76.2		48.2		64.3		64.7	
LAND USE 20%	AGRICULTURE	13	suitability	2.13	27.7	1.13	14.7	4.43	57.6	2.0	26.0	2.71	35.2	1.25	16.3	1.25	16.3	3.13	40.7	3.5	45.5	3.0
	INDUSTRIAL ZONING	5		1.38	6.9	2.0	10.0	1.57	7.9	3.63	18.2	2.0	10.0	3.38	16.9	3.0	15.0	1.5	7.5	2.13	10.6	3.88
	OTHER ZONING	2	rural - limited use	1.43	2.9	2.29	4.6	3.5	7.0	2.29	4.6	1.67	3.3	3.57	7.1	3.43	6.9	2.14	4.3	4.0	8.0	3.29
	TOTAL - LAND USE				37.5		29.3		72.5		48.8		48.5		40.3		38.2		52.5		64.1	
SOCIAL 35%	POPULATION	25	proximity density haul routes	2.63	65.8	2.38	59.5	4.0	100.0	2.63	65.8	2.86	71.5	2.75	68.8	2.63	65.8	2.63	65.8	3.5	87.5	3.38
	RECREATION	5		2.13	10.7	1.5	7.5	1.86	9.3	3.38	16.9	2.43	12.2	2.13	10.7	2.0	10.0	2.38	11.9	2.25	11.3	1.88
	AESTHETICS	5	visual	3.0	15.0	2.75	13.8	4.14	20.7	2.88	14.4	2.71	13.6	3.0	15.0	2.25	11.3	2.88	14.4	3.5	17.5	3.38
	TOTAL - SOCIAL				91.5		80.8		130		97.1		97.3		94.5		87.1		92.1		116.3	
	SITE TOTAL				232.7		224.0		303.8		292.2		245.3		280.0		234.1		263.9		294.2	
	RANKING MAJOR SITES (1-11 and 13)			2		1		12		10		4		8		3		6		11		9

NOTES:

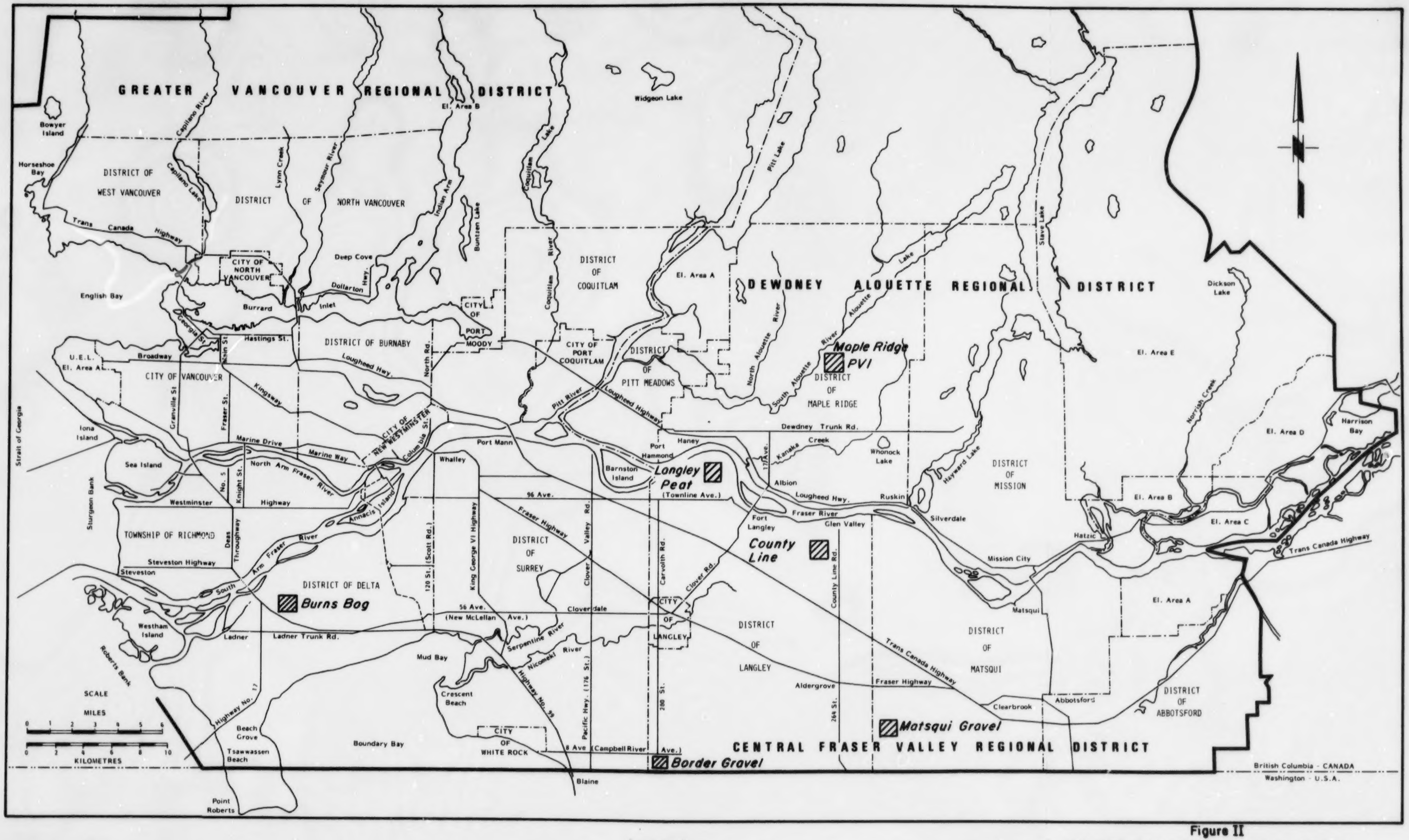
1. EACH FACTOR HAS BEEN ASSESSED ON A SCALE OF 1 TO 5, WHEREIN: 1 REPRESENTS A VERY LOW IMPACT CONSTRAINT, 2 A LOW IMPACT CONSTRAINT, 3 A MODERATE IMPACT CONSTRAINT, 4 A HIGH IMPACT CONSTRAINT, AND 5 A VERY HIGH IMPACT CONSTRAINT.

2. SITES 4 AND 7 ARE SUBJECT TO TRANSPORT CANADA ZONING REGULATIONS. AMONG OTHER REQUIREMENTS, THE REGULATIONS PROHIBIT THE PLACEMENT OF WASTE MATERIAL "ATTRACTIVE TO OR EDIBLE BY BIRDS" ACCORDINGLY, THE OPERATING FACE OF A LANDFILL IN THESE AREAS WOULD HAVE TO BE FULLY COVERED BY NETTING OR SCREENING, OR OTHER EQUAL MEASURES WOULD HAVE TO BE PROVIDED TO COMPLY WITH THE INTENT OF THE REGULATIONS.

3. SITES 12 AND 14 ARE MINOR SITES NOT SUITABLE AS A REGIONAL LANDFILL. HOWEVER, THEY MAY PROVE ECONOMIC AS LANDFILL SITES FOR PITT MEADOWS AND MAPLE RIDGE IN THE EVENT OF A NEW LANDFILL BEING ESTABLISHED TO SERVE THE COMMUNITIES SOUTH OF THE FRASER RIVER.

GROVE	SITE No. 10 GLOUCESTER PROPERTIES - LANGLEY		SITE No. 11 COUNTY LINE - LANGLEY		(3) SITE No. 12 MAPLE RIDGE GRAVEL		SITE No. 13 PITT POLDER		(2) SITE No. 14 MAPLE RIDGE P.V.Ir.	
x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)	Av. No. of Points	Total Points (Av. x Weight)
6.6	2.13	6.4	2.13	6.4	3.57	10.7	2.0	6.0	4.0	12.0
2.5	1.5	3.0	1.75	3.5	2.43	4.9	1.0	2.0	2.5	5.0
24.8	2.88	25.9	2.63	23.7	3.71	33.4	2.43	21.9	2.5	22.5
10.5	2.25	9.0	2.0	8.0	1.86	7.4	2.71	10.8	1.5	6.0
4.5	2.38	4.8	2.5	5.0	3.0	6.0	3.86	7.7	4.5	9.0
49.1		49.1		46.6		62.4		48.4		54.5
34.7	2.67	34.7	2.17	28.2	2.17	28.2	3.0	39.0	3.0	39.0
30.0	2.33	28.0	2.66	31.9	1.67	20.0	4.83	58.0	2.0	24.0
64.7		62.7		60.1		48.2		97.0		63.0
45.5	3.0	39.0	3.25	42.3	1.0	13.0	2.57	33.4	1.0	13.0
10.6	3.88	19.4	1.75	8.8	2.86	14.3	1.29	6.5	1.5	7.5
8.0	3.29	6.6	2.57	5.1	2.17	4.3	1.14	2.3	2.0	4.0
64.1		64.0		56.2		31.6		42.2		24.5
87.5	3.38	84.4	2.63	65.8	3.28	82.0	2.0	50.0	2.0	50.0
[illegible]	1.88	9.4	2.13	10.6	2.0	10.0	3.86	19.3	1.5	7.5
17.5	3.38	16.9	2.58	12.9	3.43	13.2	3.43	17.2	2.0	10.0
118.3		110.7		89.3		109.2		86.5		67.5
[illegible]		286.5		252.2		251.4		274.1		209.5
		9		5		N A		7		N A

TABLE V


GREATER VANCOUVER REGIONAL DISTRICT
DEWDNEY ALOUETTE REGIONAL DISTRICT
CENTRAL FRASER VALLEY REGIONAL DISTRICT
Bowyer Island
Horseshoe Bay
DISTRICT OF WEST VANCOUVER
Capilano River
Capilano Lake
DISTRICT OF NORTH VANCOUVER
Lynn Creek
Seymour River
Indian Arm
Buntzen Lake
El. Area B
Trans Canada Highway
CITY OF NORTH VANCOUVER
Deep Cove
Dollarton Hwy.
English Bay
Burrard Inlet
Georgia St.
Hastings St.
Main St.
U.E.L.
El. Area A
Broadway
CITY OF VANCOUVER
DISTRICT OF BURNABY
Lougheed Hwy.
Kingsway
North Rd.
CITY OF PORT MOODY
Coquitlam Lake
Coquitlam River
DISTRICT OF COQUITLAM
CITY OF PORT COQUITLAM
Pitt River
Pitt Lake
Widgeon Lake
DISTRICT OF PITT MEADOWS
Lougheed Highway
El. Area A
North Alouette River
South Alouette River
Alouette River
Alouette Lake
Maple Ridge PVI
DISTRICT OF MAPLE RIDGE
Dewdney Trunk Rd.
Stave Lake
Dickson Lake
El. Area E
Norrish Creek
El. Area D
Harrison Bay
Strait of Georgia
Iona Island
Sea Island
Granville St.
Fraser St.
Marine Drive
Marine Way
North Arm Fraser River
CITY OF NEW WESTMINSTER
Columbia St.
Port Mann
Whalley
Haney
Port Hammond
Barnston Island
Langley Peat
(Townline Ave.)
Kanaka Creek
Whonock Lake
Albion
Lougheed Hwy.
Ruskin
Hayward Lake
DISTRICT OF MISSION
El. Area B
El. Area C
Silverdale
Hatzic
Trans Canada Highway
Sturgeon Bank
No. 5
Knight St.
Westminster Highway
Annacis Island
TOWNSHIP OF RICHMOND
Deas Throughway
Steveston Highway
Steveston
South Arm Fraser River
96 Ave.
Fraser Highway
Valley Rd.
Clover Valley
DISTRICT OF SURREY
King George VI Highway
120 St. (Scott Rd.)
DISTRICT OF DELTA
Burns Bog
Fort Langley
Fraser River
Glen Valley
County Line
Carvolth Rd.
Clover Rd.
County Line Rd.
Mission City
Matsqui
56 Ave.
(New McLellan Ave.)
Cloverdale
CITY OF LANGLEY
Westham Island
Ladner
Ladner Trunk Rd.
Serpentine River
Nicomekl River
Mud Bay
DISTRICT OF LANGLEY
Trans Canada Highway
DISTRICT OF MATSQUI
El. Area A
Roberts Bank
Highway No. 17
Highway No. 99
Crescent Beach
Pacific Hwy. (176 St.)
200 St.
Aldergrove
264 St.
Fraser Highway
Clearbrook
Abbotsford
DISTRICT OF ABBOTSFORD
SCALE
MILES
0 1 2 3 4 5 6
0 2 4 6 8 10
KILOMETRES
Beach Grove
Tsawwassen Beach
Boundary Bay
CITY OF WHITE ROCK
8 Ave (Campbell River Ave.)
Border Gravel
Matsqui Gravel
Blaine
Point Roberts
British Columbia - CANADA
Washington - U.S.A.
N

Legend

▨ Landfill

Figure II

SIX TOP RANKED LANDFILL SITES
IDENTIFIED BY THE LANDFILLS COMMITTEE

While this process has identified these sites as being potential landfill sites, detailed technical, environmental and socio-economic studies have not been carried out. It is essential that these studies be undertaken and economic evaluations carried out before final selections are made. These studies will require the establishment of a significant budget, perhaps several hundred thousand dollars for each site to be investigated in detail.

3.7 The Landfills Report identifies the most common problems associated with landfills and discusses measures for their mitigation. These problems include:

- leachate escape and consequent degradation of the environment
- gas and odour impacts
- traffic congestion and noise impact on neighbours near the landfill and on those living along preferred haul routes
- scavenging birds and animals attracted to the landfill
- visual impacts
- fish and wildlife impacts

The decision to site a landfill in any particular location must include a full committment to address all legitimate concerns in a detailed design and an operational plan.

This must include a complete description of:

- the end use envisaged for the site;
- how the site is to be prepared to ensure there will be no uncontrolled discharge of leachates;
- the method of minimizing bird and animal problems;
- the method of controlling gases and odours; and
- any other problem identified by the detailed studies.

3.8 Projections of costs for site acquisition, development, and operation of each of the six top-ranked sites are provided in Tables 6.1, 6.2, and 6.3. of the Landfills

Report.

3.9 There are eight active landfill sites within the study area. Four have limited capacities remaining, and are the subject of separate studies by the LMRP. They include:

Richmond Landfill, Fraser River Harbour Commission
Port Mann Landfill, Surrey
Cottonwood Landfill, Maple Ridge
Matsqui Landfill

Three of the remaining four landfills have areas under permit which have capacities remaining of more than three years. They include:

3.9.1 Vancouver Landfill, Burns Bog, Delta

This landfill has considerable remaining life depending on a number of factors including the area to be filled, depth of fill, and receiving volume. The site (including the recent extension) has the capacity to last for from 30 to 60 years or more.

3.9.2 Mission Landfill (Minnie's Pit)

The District of Mission recently obtained an amendment to their Waste Management Permit to allow an extension of the site. At the present fill rate this site has the capacity to last for a further 10 years.

3.9.3 Langley Landfill

The Township of Langley operates a landfill which has a remaining capacity of approximately 6 years based on current fill rates and depth of fill. There is reportedly some leachate escapement, a problem which must be addressed.

3.9.4 Premier Street Landfill, North Vancouver

This site has the capacity within the present permitted area to satisfy the needs of the North Shore Communities until the end of 1986. At the present rate of filling it is feasible to extend its capacity an additional 12 years, to 1998.

The above four sites should be included in the Waste Management Plan and the operators of these landfills should be required to prepare an operating plan that would address the environmental concerns in the same manner as they would be addressed at any new landfill.

3.10 There are two proposals for landfilling outside of the study area - barge transport of waste to Texada Island for landfilling in mined rock quarries, and train transport of baled refuse to the Interior of B.C. for landfilling in mined-out surface coal mines. A brief overview of the Texada proposal is included in Section 7 of the Landfills Report. The rail haul proposal is the subject of a feasibility study by a private organization. A copy of the study has been provided to the LMRP.

4.0 Thermal Reduction Summary

4.1 Description of Thermal Reduction Processes

MBG (mass burning on moving grates) plants accept wastes as received and the moving grate feeds them through the furnace. Commonly steam is raised by water wall boilers. Several hundred of these systems operate all over the work, most of them in Europe and Japan. They have proved reliable and durable and dominate the market in the 180 to 3,000 tonne/day range.

RDF (refuse derived fuel) plants separate the combustible fraction of the waste, by shredding, and air or ballistic separation or trommelling. The resultant fuel may be burned as fluff in semi-suspension burners (SSB) or may be pelletized for transport to industrial burners. The production of RDF is relatively new technology which has had significant problems. Application of SSB units for burning of RDF is also relatively new and has run into some problems. Steam raising in water wall boilers is similar to

MBG systems, and the RDF/SSB systems span a comparable size range. Pelletized fuel has usually proved difficult to market.

A recent count of major incineration projects in the U.S.A. showed that sixteen MBG plants and three RDF/SSB plants were planned or under construction. A number of RDF plants have been shut down for technical or economic reasons.

MOD (modular unit) plants are of various designs, but most employ two chambers, namely a primary chamber with limited combustion air supply and a second chamber to burn out the resultant gasses at a high temperature. Many of these plants have been constructed in the under one hundred tonne per day (t/d) range with units up to 45 t/d commonly shop-fabricated and shipped in as complete units. Improvements in technology, including addition of automatic ash removal systems, have in recent years lead to bigger more sophisticated plants using larger units which have to be assembled on site. Plants up to 200 t/d are now operating and somewhat larger ones are planned. Generally experience has been good, but the working life of MOD plants is not yet well established.

P (pyrolysis) plants thermally decompose wastes in an oxygen deficient atmosphere producing carbon, char and/or fuel gas or oil, or a combination of them. These systems have not been satisfactory so far for treating municipal wastes.

FBC (fluidized bed combustion) plants burn the waste in a bed of hot sand, fluidized by blowing in air at the base. The refuse must first be shredded. These systems have not yet been proven in practice.

A number of other systems have been tried but are considered unproven.

4.2 Energy Recovery

Energy recovery is achieved through transfer of heat to water in a boiler to produce steam or hot water for heating buildings, for industrial processes or for generation of electricity. Heat transfer from the combustion gases cools them and reduces their volume, which is necessary for efficient cleaning of the gases before emission. MOD units equipped with waste heat boilers are not as efficient at recovering energy as MBG or SSB units with water wall combustion chambers. Using unprocessed refuse of average heat value, each tonne of refuse burned will produce approximately 2.5 tonnes of steam of MBG plants or 2.2 of MOD plants. Major MBG plants can generate roughly 450 kilowatt-hours of electricity per tonne of refuse burned. However, the revenue from sale of electricity to B. C. Hydro would be less than that from sale of steam to users who otherwise would generate steam from natural gas. This is because of the low rates paid by B. C. Hydro for such energy.

4.3 Plant Operation

To function properly, any incinerator requires a well qualified and experienced operating team. "Design, build and operate" contracts ensure this best, as the contractor may involve a firm specializing in plant operation or may use the technology vendor's experience in training operating personnel.

4.4 Control of Emissions

Certain emissions can damage the environment or public health, or there are concerns that they may do so. Emission limits with appropriate controls must be set, both to define which emissions in fact need controlling and to what levels. Such controls may be a limitation on the amount of emission per tonne of refuse or per unit of flue gas at standard conditions. The quality of the ambient air in the vicinity may dictate emission limits.

Particulate emissions may well have to be controlled to lower levels than heretofore required in British Columbia.

Nitrogen oxides, hydrocarbons, carbon monoxide and sulfur oxides will lie within acceptable limits if an incinerator is adequately designed and operated but appropriate limits should be set.

The need to control hydrogen fluoride and hydrogen chloride by means other than effective dispersal through a high stack is doubtful. It will depend on the size of the plant, atmospheric conditions, terrain and prior ambient concentrations. If site-specific conditions require additional controls, appropriate scrubbing technology exists for removing these acid gases.

Trace elements will lie within currently acceptable limits and no controls are necessary.

No need for specific control of dioxins and furans has been established in testing a considerable number of plants in North America and Europe. Emission levels from a well designed and operated plant are not thought to pose any significant public health hazard for residents living in the vicinity of a refuse incinerator, not even for long term exposure to the low levels that are found. However, it is highly probable that efficient particulate control technology will reduce air emission of these compounds to the extent that they are attached to particulates. Considerable research and further testing is being conducted in North America and Europe, which should soon provide more information on relationships between emissions and combustion conditions and on other questions.

4.5 Leaching from Landfill Residues

Pollutants, mostly salts, can leach from incineration ash in the same manner as the leaching that occurs from sanitary landfills. Several field tests on residue deposits in Europe have shown that other than in laboratory tests being conducted under neutral or acidic conditions - the alkaline field environment prevents mobility of heavy metals so that these occur in field leachate only in low concentrations. Nevertheless, leachate from ash landfills should be contained and controlled, just as leachate from deposits of raw wastes.

4.6 Design and Commissioning

In general it takes three to four years from a decision to proceed before a medium sized plant can be brought into service.

4.7 Quantity of Burnable Waste and Residue

Accurate knowledge of the amount of burnable waste would be required only if a decision were to be made to burn all the wastes in one or two large incinerators. If a less ambitious program were to be introduced consisting of smaller plants, then the problem of accurately estimating the quantity of burnables does not arise since enough wastes can be supplied to the incinerators to keep them operating at capacity and the seasonal variations can be handled by the flexible bulk transport and landfill disposal component. The residue from burning one tonne of refuse occupies about 1/6 of the volume needed for landfilling a tonne of raw refuse. On an overall basis, if 15% of the refuse is considered unsuitable for burning, the overall landfill space requirement by burning 85% of the wastes is about 30% of that for landfilling all the wastes, so that the life of a landfill can be extended about 3-1/2 times if all the waste suitable for burning were to be incinerated.

4.8 Facility Size and Site Area

The size of large incinerator plants is calculated from the amount of refuse they must handle on an annual basis. Allowances must be made for down-time for maintenance. Also the waste stream is not constant throughout the year and varies as well from day to day. These factors must be taken into account in sizing units, particularly if the plan is to "burn it all". If only part of the waste stream is to be burned, the landfill can be used to handle the variations.

Smaller units without energy recovery are usually operated intermittently (one shift per day) with cooling down between shifts for ash removal. They can be sized on weekly average quantities, lengthening or shortening the working day or week to cover variations.

The area required for a plant will range from one hectare or less for a small plant to about five hectares for a very large one.

4.9 Social Impacts

Visual aspects of a new refuse disposal or handling facility, odour, noise, traffic and potential nuisance influences which have a disturbing effect on people in an area, are said to have a "social impact", individually or in total.

Modern incinerators generally have a pleasing appearance that is not out of place in an industrial area. Many incinerators in Europe and Japan have been built in or near to residential areas or in the core of cities. This is not to suggest that such a site need be considered here, but only to indicate that such a facility can be an acceptable neighbour to other community enterprises. The most prominent feature of larger refuse incinerators is the stack. The stack emission will not normally be visible except for water vapour under certain weather conditions.

Noise comes from traffic and from some of the equipment located outside the incinerator building. However, with normal care community noise standards can be met.

The traffic noise and frequency on the access road is comparable to that on the access road to a landfill. For a very large plant, it would depend on the extent to which transfer stations are used instead of direct haul. However, residue hauling from the incinerator would add some additional traffic. No undue traffic disturbance is anticipated at any of the sites considered. Nuisance problems from birds, dust, odours, rodents and large animals do not arise at incineration plants.

4.10 Costs

Cost figures in the literature are complex and often do not define what costs are included. Studies done locally increase confidence that the figures in Table III are reasonable for the MOD and MBG plants. The figures for large MBG and SSB plants were derived from 1,000 tpd plants and are therefore approximate.

The Federal FIRE grant, if received, would reduce the capital costs for the steam generating plants by approximately 18.5%.

In view of the relatively short operating experience for modular incinerators, a 15 (fifteen) year amortization period is recommended for cost comparisons. Twenty years for amortization of

TABLE III

Approximate Incineration Costs Adapted from Thermal Reduction Report

Facility Type	Rated Capacity tonne/day	Throughput Capacity tonne/annum	Capital Cost 10^6 $	Operating Cost $/tonne	Revenue $/tonne	
					Year 1	Year 25
Modular with no energy recovery (MODNE)	50	13,000	3.2	28	0	0
	100	26,000	6.2	25	0	0
Modular with steam generation (MODER)	100	31,000	10.4	45	17	23
	200	63,000	20	35	17	23
Mass burning with steam production (MBG)	228	70,000	34	31	21	28
	456	140,000	58	25	21	28
Mass or semi suspension burning with electrical power generation (MBG/SSB)	2000	620,000	250	21	9	15
	3000	930,000	356	19	9	15

large units is felt reasonable although many large MBG incinerators have already lasted longer.

4.11 Alternative Scenarios

The scenarios that may be considered range from one facility to incinerate everything suitable for burning, to numerous incinerators to burn all or part of the waste.

The single facility concept involves massive capital, a total commitment to one installation and the problem of transporting all the waste to one location. This scheme is referred to as Scenario "A".

A scenario at the other end of the range is found by determining at how many locations one might be able to sell steam, noting that the lowest cost units are the MBG steam-producing plants. This leads to a scenario with five practical locations for medium size MBG steam producing plants. If all were to be constructed, they would handle about half a million tonnes per annum and the capital cost would be approximately $200,000,000. this scheme is referred as a Scenario "B".

In addition, small plants could be constructed in rural areas, and in such cases it is not normally economical to attempt to recover energy.

4.12 Greater Vancouver Regional District Initiative

In 1982, The Greater Vancouver Sewerage and Drainage District (GVSDD) requested proposals for a 228 tonne per day thermal reduction plant. Of those offered, some of the MBG plants provided the most economical solution with a better record than the other designs. GVSDD has asked for bids for such a plant, as well as a bid for a plant twice that size, from three experienced groups. It was agreed this initiative should not be held up because the LMRP, although there is no commitment to incorporate the incinerator in the plan. Because of the investigations that have already been done for this plant and because the sale of steam has already been arranged this plant could be commissioned long before any other.

In addition, such a facility would provide an excellent research tool, particularly in regard to emissions.

4.13 Recommendations of the Thermal Reduction Committee.

If incineration is to be adopted in the plan, it is recommended that:

1. Scenario "B" be adopted using up to five MBG plants, introducing them gradually as the plan develops a requirement for them.
2. The GVRD plant be the first to proceed.
3. The manufacture of a refuse-derived fuel for use by industry be left to industry initiative.
4. Emission standards be set by Provincial Environment and Health Agencies and be checked in accordance with a detailed monitoring program.
5. An appropriate agency be commissioned to maintain state-of-the-art knowledge about thermal reduction of refuse.
6. Consideration be given to setting aside a 6 to 8 hectare site, possible on Annacis Island, recognizing that in the future the single incinerator option may be favoured.
7. If the GVRD plant proceeds, Federal and Provincial Agencies be invited to use it for research.
8. The installation of rural facilities be considered. These may prove desirable to serve small areas but they need not impact on the regional plan.

5.0 Resource Recovery and Recycling Summary

5.1 The report on resource recoveryand recycling relates to the problems of waste management in the Lower Mainland, but aside from the potential benefits to the Waste Management Plan, the committee also addressed the issue from a broader perspective which included conservation of resources.

The report proceeds from a review of the philosophical issues of recycling to an examination of the impact which recycling could have on the waste stream and finally to a series of conclusions and recommendations.

5.2 The Resource Recovery and Recycling Committee spent considerable time concentrating on the evaluation of markets for recycled materials. Regardless of the motivation behind a potential recycling program, there must be a market or other appropriate end use for the material recovered. No program can survive for long without a useful end product. The evaluation of markets indicates that some are very limited or highly vulnerable to fluctuations. Some may be quite strong while there is a limited supply of recycled material but could weaken dramatically if everybody were participating. Thus two of the recommendations deal with the development of markets.

The market situation together with the possibility of contamination by toxic substances are also the prime reasons that the committee did not recommend regional composting. Backyard and municipal garden waste composting does not face the same problems and thus is strongly encouraged.

A typical composting operation at the municipal level would consist of a fenced enclosure of several acres out ot the way of residential development, perhaps in a corner of a large park, open and supervised on weekends. The supervision is necessary to prevent dumping of unwanted materials. The refuse collection bylaw would prohibit the disposal of tree and garden waste and lawn clippings at the curbside in order to encourage the residents to bring this material to the municipal compost facility. Costs to the municipality would be the supervision of the facility and the equipment and labor cost to windrow and turn the compost at intervals. Savings to the municipality would include collection and transportation costs as well as the landfill fee for the tonnage diverted from the landfill. Problems with municipal composting include traffic and odors as well as the difficulty of keeping undesirable material out of the composting site. Aside from the compost which can be used by most municipal parks departments, some municipalites have made surplus compost available free to residents who wish to pick it up.

The composition of the waste stream was studied on the basis of research by others. This reasearch did not include the approximately 30% which is refuse not generated from homes (Non-municipal refuse). Garbage is not an unvarying product so evaluation of its composition must be viewed circumspectly. Although, the report uses tonnage figures for various components in the Lower Mainland waste stream it should be remembered that the quantities can only be used to determine the order of magnitude of various recyclables in the waste stream. The 30% of non-municipal refuse might have disproportionately high percentages of some recyclables.

Keeping in mind the problems of using precise numbers to show imprecise results, some idea of the waste stream and current recycling activities can be gained from the following 1982 figures for normal municipal refuse:

- total annual weight of lower mainland waste-	1,000,000 tonnes
- less selected materials currently being recycled-	69,000 tonnes
- actually going to landfill-	931,000 tonnes

- the four primary materials currently being reclaimed from the waste stream are as follows:

a. old newspaper	generated	73,000 tonnes
	reclaimed	26,000 tonnes
b. corrugated cardboard	generated	85,000 tonnes
	reclaimed	40,000 tonnes
c. glass	generated	52,000 tonnes
	reclaimed	2,000 tonnes
	(not including reusable bottles)	
d. metals	generated*	46,000 tonnes
	reclaimed	not available

*(does not include commercial scrap metal or scrap not normally landfilled)

-additional materials which might be reclaimed through a concentrated area-wide curbside collection program include:

a. old newspaper	18,000 tonnes
b. glass	16,000 tonnes
c. metal	7,000 tonnes

-percentage of waste stream for existing recycled materials - 7%

-percentage of waste stream of all recycled materials if area-wide curbside pickup program implemented - 11%

-potential decrease in waste stream- 4%

(see the Recycling and Resource Recovery Report for exclusions from this calculation)

5.4 The conclusion and recommendations of the committee in Section 3 and 4 of the report are already concise. For convenience they are listed here again in point form:

5.4.1 Conclusions

a) Recycling is worthwhile and should be promoted.
b) The re-use of manufactured materials is more beneficial to conservation than conversion into fuel or compost.
c) Recycling will not eliminate and may not even greatly reduce the need for landfills or incineration.
d) The lack of information on non-municipal waste is likely result in the underestimation of materials available for recycling.
e) A surprisingly large percentage of some materials is already being recycled.
f) Under normal accounting methods, multi-material recycling by curbside pickup does not pay for itself.
g) The best way to increase recycling is to guarantee a high and stable market price for the product.
h) If more materials are to be recycled then some way must be found to increase the market demand for them.
i) The greatest potential savings to the community occur when recycling takes place prior to municipal collection.
J) The scope for reduction of volume at the source is tremendous.
k) Legislation at the local level is seen to be the most effective incentive for people to reduce their volumes.
l) Legislation at other levels of government could also be effective through control of marketing and packaging, and incentives to encourage the use of recycled materials.

m) Diversion credits are seen to be impractical to implement and a distortion of markets.

5.4.2 Recommendations

(1) Education

A. All governments can play a part in the promotion of recycling activities through education of the public.
B. Efforts in education should be concentrated on young people whose attitudes are still flexible.

(2) Legislation

A. Municipalities should consider "pirating" bylaws to assist multi-material pickup programs.
B. Private and community compost facilities should be supported by restrictive refuse collection bylaws.

(3) Financial Controls

A. The Committee does not recommend incentives in the form subsidies.
B. Incentives in the form of penalties could be used to encourage recycling.
C. Tipping fees should cover total costs so that true comparisons can be made with recycling costs.
D. If subsidies are considered at all, they should be grants rather than diversion credits and should preferably be aimed at market development rather than collection.

(4) General

A. Urge the federal and provincial governments to encourage research into development of new products from or new markets for recycled materials.

B. Encourage the federal government to implement an action plan for increased recycling as proposed in the preliminary Environment Canada action plan (attached as

Appendix "G" to the Resource Recovery and Recycling Report).

C. Incorporate into the Waste Management Plan the provision to cooperate with organizations who wish to set up pilot plants to test or demonstrate new or alternate technology for the disposal of waste.

D. All Tender calls for waste management systems should include requirements for proposals for recycling and all parts of the Waste Management Plan should incorporate provisions for recycling of materials having economic value.

6.0 Other Studies and Reports

6.1 Social Cost Assessment of the Proposed Waste Disposal Facilities - Lower Mainland Refuse Project.

This report was prepared for the LMRP by Mr. Chris Zeiss M. Sc. Planning; M. Eng. The following "executive summary" is a verbatim copy of the the summary in the report.

Executive Summary

Introduction

The purpose of this study is to identify, analyse and quantify the social costs of solid waste disposal facilities and operations in the Lower Mainland of British Columbia. This preliminary study will allow the decision-makers to compare the costs of various external effects in a consistent framework. The monetized social costs can be added to the financial costs, while the differences in non-monetized social costs must be weighed against the differences in the total of the monetized costs. By considering the social costs in the early stages of decision-making, an overall least-cost solid waste plan can be established. The results of this study will help reduce the overall costs to society and, hence, reduce specific and possibly compensable costs to the waste agency in the Lower Mainland.

, The scope of the study encompasses only waste disposal; collection activities are not considered here. The study area comprises the municipalities in the Greater Vancouver Regional District(GVRD), in the Central Fraser Valley regional District (CRVRD), and in the Dewdney Alouette Regional District (DARD). Together, they comprise approximately 1.4 million residents in 520,000 households generating a waste stream of 1.1 million tonnes.

Methodology

The external effects of the types of disposal facilities under consideration are identified from operational characteristics and citizen and expert judgement (see Zeiss, 1984b):

In order to quantify the costs, the spatial distribution of the various cost categories is derived qualitatively. Nuisance costs are concentrated in the immediate vicinity of the facilities while land alienation, recreational losses, resource losses, etc. can be widspread. Overall, however, there is a district concentration of costs near the facility and next to the hauling routes.

Expert opinions were obtained to determine the distances from the site affected by nuisance effects. A survey of public representatives was incorporated to the impact maximum property value losses, the time value of resources disposed, and alienated land. Also, the potential distances for risks and distributional costs were established from the survey results. The table below shows the cost method used and the data sources.

Social cost calculations

The scenarios were identified to reflect the extremes in waste disposal plans:

- Scenario A comprises 100% landfilling capacity including two large regional landfills (Burns Bog in Delta, and one of four sites in Langley and Matsqui, plus a small landfill in Maple Ridge and five transfer stations).

- Scenario B comprises 40% incineration capacity and 60% landfill capacity including five incierators (at 60,000 to 140,000 tonnes p.a. capacity each), two regional landfills (Burns bog in Delta and one of four possible sites in Langley/Matsqui, Maple Ridge landfill and two to three Transfer Stations).

The actual social cost calculation was carried out in two places; some cost items (e.g., property values losses, land alienation, local truck traffic impacts, recreational impacts and distributional costs were done on a site-specific basis; water pollution, air pollution, regional truck traffic impacts were calculated on a scenario-specific basis.

This is true for all social cost categories, e.g. in that property value losses do not reflect the total loss of well-being to the residents affected. As a result, the social costs presented here constitute a lower bound of the real costs.

The largest cost items in both scenarios are the ecological costs (resources lost and land alienation). Unfortunately, they are also the most difficult to estimate accurately and reliably. But the statement in the previous paragraph indicates that it would be a mistake to discount these costs since they could be substantially larger.

Moreover, the unanticipated importance of these ecological cost elements leaves out the size of such "hidden" intangibles in the context of siting waste facilities: resources disposed and land alienation would not be considered a real cost in conventional cost benefit analysis, nor would distributional effects be counted. But it seems to be elements such as these that give rise tothe most emphtic oppostion when a disposal facility is to be located.

This study indicates the combinations of Burns Bog with Matsqui-Gravel to be the least expensive alternaties for both Scenarios A and B. Burns Bog and Langley County Line sites combination is only 3% more.

Scenario B causes substantially lower total social costs (by about $35 million) if the energy production is accounted for in valuing the air emissions. If full air pollution costs are counted, then two combinations of scenario A (i.e., BB-MG and BB-LC) are about 5% less expensive in monetized costs. But Scenario B is estimated to cause less non-monetized costs as well.

The full report on Social Cost Assessment is available at the LMRP information centers.

The use of this type of study requires a major political decision. A decision to undertake such an assessment would mean that the social costs could be incorporated in the detailed studies to be carried out in the Implementation Phase in 1985-86.

6.2 Distressed Wastes Study

This report was commissioned by the EPS of Environment Canada. It will be important with respect to operations under the Solid Waste Management Plan. It does not, however, influence the discussion of the concepts in this Concepts Report and is therefore not summarized here. It is available at the LMRP information centers.

6.3 Public Interest Group Reports

A number of the public and private interest groups who attended the six workshops held during 1984 proposed to the project manager that they prepare position papers on a number of subjects that had been discussed. This was agreed and those papers appear in a separate volume available at the information centres.

The public interest groups prepared a summary of their position papers and this appears as Appendix B of this report.

CHAPTER VII PRINCIPLES OF SOLID WASTE MANAGEMENT

1.0 Introduction

The goal of the LMRP is to devise a Solid Waste Management Plan comprised of a transportation and disposal system that is socially and environmentally acceptable, technically sound and practicable, and that achieves these goals at the lowest possible cost.

The previous chapters have described the studies carried out up to now under the LMRP. This chapter describes the tentative conclusions arrived at as to the principles on which such a Solid Waste Management Plan should be based. The principles have been followed, wherever they apply, in formulating the scenarios which follow in Chapter VIII.

The principles arise in part from the work of the committees. In some cases they are specific recommendations and in others they are implicit in the reports. A quite independent major source for the principles was the discussion of a series of questions posed at a Workshop on August 25, 1984. In addition many workshop participants wrote answers to the questions as did some members of the Technical Committee.

These tentative conclusions on principles are presented so that everyone understands the basis of the scenarios and has an opportunity to comment on them and to suggest alternatives. The principles are not intended to be a legalistic expression of fixed rules and regulations. Rather they are meant to express the philosophy behind the scenarios and ultimately the Solid Waste Management Plan.

The principles go beyond those needed for developing a solid waste management plan into the implementation and management of such a plan, and may be considered by some people to be beyond the scope of this report. Nevertheless they are included in order to record suggestions and opinions that have been brought up during the development of the scenarios in Chapter VIII.

The principles are grouped generally according to the way the studies were carried out under the following headings:

a) General
b) Landfills
c) Thermal Reduction
d) Resource Recovery and Recycling
e) Economic Strategies
f) Transport and Transfer Stations

2.0 General Principles

2.1 An Area-Wide Plan

In accordance with its terms of reference, the Lower Mainland Refuse Project has considered the handling of solid wastes in the area without reference to jurisdictional boundaries. This has resulted in a series of concepts which all have as their basis a single area-wide plan. Indeed, a plan extending beyond jurisdictional boundaries is dictated by the impossibility of some municipalities disposing of refuse in their own territories. This principle underlies the scenarios and will underly the Solid Waste Management Plan.

2.2 An Area-Wide Solid Waste Management Authority.

The terms of reference refer to a plan embodying the best technical solution. There is a widely held opinion (not a unanimous one) that a corollary of an area-wide plan is an area-wide authority to administer the plan. Such an authority might be a new independent organization. It also might be a grouping of existing staff or institutions in the municipalities, regional district and the Ministry of Environment. However, it is not inconceivable that two authorites might operate, for example one in the eastern and one in the western parts of the area. There are a number of ramifications to these ideas discussed under economic strategies. Members of public interest groups generally feel that:

a) The authority should be as independent as possible with respect to the appointment of members and also as to sources of financing.

b) There should be public involvement in the operation of the waste management plan as well as in its creation. The plan should be reviewed regularly and publicly.

2.3 Use of Proven Technology

There was a consensus in the Technical Committee that we should rely on proven technology and not indulge in extensive research or experimentation. On the other hand the authority should carefully follow new developments and be prepared to incorporate new techniques as they are proven.

2.4 Continuing but Modified Use of Landfills

There is no technology at present that will allow us to eliminate landfills completely. There are several ways to modify the landfill design and its use and operation. New landfills should be model landfills, developed as recommended by the Landfills Committee. Existing landfills should be upgraded as soon as possible to the standards set out in the Landfills Report. For the next two years it is inevitable that we continue much as we have in the past until new designs, procedures and technology can be implemented. Thereafter, several courses should be pursued to reduce the amount of material going to landfills and to change its nature.

(i) In the long term, education and legislation should be used to cut down the amount of packaging-produced garbage.

(ii) Recycling and resource recovery should be encouraged to remove as much as possible from the waste stream.

(iii) Thermal reduction is a good option which reduces the weight and volume of residue left for landfills and renders it relatively inert. This can, of course, only be accomplished at a significant extra cost.

(iv) Composting by individual households for home use needs to be encouraged as does the provision of locations to which residents and businesses can take compostable material.

(v) In the long-term, mass sorting at transfer stations or incinerators could be undertaken to increase the effectiveness of thermal reduction, resource recovery, recycling and to increase composting. Once again, this will add significantly to operating costs.

2.5 Ownership of Landfills

Landfills for municipal wastes in general should be on public land. There is then a clear responsibility recognized from the beginning for operation of gas and leachate control facilities for as long as they are needed. In addition the public will benefit from the appreciation of value which will eventually occur when the landfill becomes usable for different purposes. Further, such ownership ensures that the location to which a community's wastes are discharged can be controlled in some measure. This is important in preventing a site intended to serve a local community for many years being filled in a few years by outsiders.

If special landfills of carefully controlled inert materials are set up this ownership principle could be modified.

2.6 Monitoring, Inspection and Control

Solid waste management is a major problem in the area which must be very carefully looked after in the future. Implicit in the creation of a responsible authority is the imposition on that authority of duties to provide for strict control procedures followed by monitoring and inspection to ensure compliance with the plan. The plan therefore must allow for the imposition of detailed requirements at a later date and for added or changed regulations from time to time. This principle underlies all the planning and recommendations that follow.

2.7 Compensation Principles

Compensation is governed by a series of statutes and by general principles of law. There seems to be no need to depart from these well established practises. The waste management authority is expected to be fair and even-handed in its dealings, governed by the following principles:

a) Property which is required for direct use will be aquired at a price to be established by professional appraisers.

b) Appraisals will be designed to not reflect any reduction in value occasioned by the activities of the authority.

c) Adequate buffer zones will be established around facilities and property in the buffer zones will be acquired as if for direct use if the owner so desires.

d) No payments other than for demonstrable physical damage will be paid to landowners who retain their property.

e) Municipalities that accomodate disposal facilities should receive adequate compensation commensurate with the services they make available.

The opinion has been strongly expressed by those who might be affected, that within a certain distance (to be determined by a third party) of a facility, if landowners wish to sell their property and professional appraisers agree that the appraised value has been lowered by the facility, the authority should purchase the property at the fair appraised price and thereafter dispose of it as it sees fit. Many municipal officials have expressed very serious doubt that this is practical. They feel it would set precedents as far as other public works are concerned such as street widenings, bridges and the ALRT.

Many people feel that municipalities which are hosts to a new landfill benefitting the whole region should receive compensation for the non-tangible disamenities they incur. For example they might be paid an amount based on or equal to the average tax yield per acre of developed industrial land in the Lower Mainland Area.

Resolution of the problems outlined above is not within the terms of reference of the present project and will have to be provided through the political process at the appropriate time.

3.0 Landfill Principles

There will always be landfills to handle the final residue from any form of treatment presently practical and this is true for the foreseeable future. As population increases and densities rise the siting of landfills becomes more difficult. It is therefore desirable that all practical methods be used to reduce the amount of material going to landfills because landfills are finite and solid waste production will continue indefinitely. In addition, every reasonable effort should be made to reduce the amount of active material going into the landfill until as much as possible is inert.

For landfills to be acceptable these principles should be followed:

3.1 End Use

For new landfills an end-use should be selected and the landfill design should provide for the effective accomplishment of this use.
For existing landfills that will continue, an appropriate end-use should now be determined and operations modified to encompass that end-use.

3.2 Adequate Buffers

In establishing new landfills, buffer zones to screen activities, deaden noise and mitigate bird or other nuisance problems should be acquired. They should be developed as necessary with grading and landscaping. Public involvement in this process is essential to achieve acceptability.

3.3 Leachate Control

The design of the landfill must preclude damage to the environment. Leachate containment, collection, treatment (on or off-site) and disposal will be necessary to the standard required to protect the receiving environment. In particular the design must be such as to prevent groundwater pollution. This can be done with presently available technology. Monitoring also can be designed to give early warning of pollution.

In spite of the confidence of engineers in their ability to handle the leachate problem not everyone is convinced.

If pollution does occur then an alternate water supply must be provided.

The cost of leachate control and the risk associated with having to provide alternate water supplies must be analysed on a site specific basis. It may be that such costs will preclude the use of some of the sites.

3.4 Pest Control

The best available technology should be applied to reduce bird and other pest problems.

3.5 Odour & Gas Control

The landfill design should provide for the safe disposal of gases and elimination of off-site odor problems.

3.6 Exposed Face

Cover should be continuous on regional sites with a defined maximum exposed face. This means that the main face can only be used by a limited number of large-capacity vehicles. There must be other provisions for private cars and small trucks.

3.7 Control

Landfills can be operated by private contractors or by municipalities. The municipalities' actions are controlled by law under the plan. This responsibility is not mitigated if they employ an agent. The authority must be responsible for complete surveillance and monitoring with inspection services as required.

4.0 Thermal Reduction Principles

The primary objective of thermal reduction is to reduce the volume and weight of residual material that must be

landfilled. A second objective is to recover from the waste the optimum amount of energy as an energy conservation measure as far as economics indicates. Whether or not to incorporate incineration is not primarily a technical decision becaue with it or without it the environment can be adequately protected. However, four matters should be borne in mind in deciding:
First, incineration greatly extends landfill life and therefore would diminish future problems in locating sites. Second, aesthetic problems at landfills are greatly reduced. Third, it is possible, though far from certain, that over the long term incinerators will prove more economical than landfills through the sale of energy. Fourth, there is much wisdom in a gradual approach to such a major new technology to establish operating procedures and costs.

Incineration of refuse has been used with varying degrees of success in Europe, Japan and the U.S. The principles under which it should be instituted here are the following.:

4.1 Gradual Introduction

If it is decided to build an incineration plant it must be recognized that the conditions that effect release of air emissions may be widely different, here in the Lower Mainland, from other areas. To learn about such conditions and to establish costs and gain experience, it would probably be prudent to install one medium size MBG incinerator and operate it under careful scrutiny.

4.2 Energy Recovery

For the initial installation it would be desirable that an energy recovery system be included so that it can be established how efficient and effective it can be and the contribution it can make to cost reduction.Energy sales should be assured before a final commitment is made so far as this is possible. A contractual commitment to buy power at an ecomonic rate would be best.

4.3 Siting

There is no significant difference between a waste incinerator and other industrial operations insofar as impact on the local area is concerned. Sites in industrial zones are a good option but other locations may well prove satisfactory.

4.4 Control and Operation

A thermal reduction plant can be operated by either municipal or private organizations. It should be designed and constructed under the control of the solid waste management authority. Experience has shown that the firm responsible for plant design and construction should also be responsible for plant commissioning and operation for a substantial number of years. Operation is just as important as design and construction and when not done by the authority itself, it should be carried out under a contract with the authority. The authority must be responsible for complete, surveillance and monitoring with the necessary inspection services.

4.5 Emission Controls

For the first installation particulate emission control should be provided. Provision must also be made for the installation of flue gas scrubbers if they are found to be necessary. It should be noted that a large number of people feel that scrubbers should be installed from the beginning, the argument being that if they are not, a serious degradation of ambient air quality will occur.

The plant should provide for a monitoring program for both gas emissions and ash, with appropriate criteria.

5.0 Resource Recovery and Recycling

Resource recovery and recycling of materials reclaimed from the solid waste stream must be vigorously pursued if solid waste management is to be perceived as credible. There are three approaches:

a) sorting at the source - "the kitchen door" with separate pick-up.
b) sorting at central points such as transfer stations.

c) de-centralized pick-up locations with a central processing station.

Facilities to separate recyclables after they are mixed in with the rest of the refuse have proved disappointing and this option should await better technology.

A serious impediment to increasing the recovery of material is the difficulty in finding a market for all the materials. The sub-section on economic strategies speaks of this. Another impediment is the cost of separate household collections.

The principles of resource recovery and recycling are:

5.1 Collecting Recyclables

To prevent materials joining the waste stream, the public must be offered convenience. This is best done by making curbside collection available, but this generally needs a subsidy. This may not be so if only one profitable item, such as newspaper, is collected but that means the collection of the remainder becomes even less practical.

The advantage of a multi-stream curbside collection system is that it makes evident a determination to remove from the garbage stream all that one can, as well as achieving that purpose. Its disadvantage is its cost and the limited extra diversion that is achieved, probably 4%; but possibly as high as 10%. However, over the years the percentage is liable to grow.

The Recycling Committee believed that quantities could exceed the markets available leading to a costly diversion back to the landfill. However markets are available for much of the recyclables at a price.

One option is to provide multi-stream curbside collection on a trial basis in experimental areas.

This must be continued for a sufficient period to allow adequate equipment tc be acquired. Extra costs should be borne by the authority because it is the disposal facilities that are being assisted.

5.2 Role of Government

The government should encourage recycling by setting up a suitable framework for recycling programs.

5.3 Legislation

All levels of government can assist with legislation such as is described in the Rersource Recoveryand Recycling ort Report. Taxes such as those that now apply to refillable containers should be re-examined.

5.4 Markets

The Federal and Provincial Governements should attempt to create and stabilize markets for recovered material.

6.0 Transportation & Transfer Stations

In general the governing factor in transportation of solid wastes is cost. Other impacts have to do with traffic loads and noise. The following principles should apply:

6.1 Haul Routes

Haul routes should stay with arterial roads and avoid residential or rural streets. If large haulers are used they can take advantage of freeways as well. If approaches to facility sites are through areas that have not previously had heavy traffic, consideration must be given to mitigation of impacts by rebuilding of roads and construction of buffers for noise and safety. Dust control must be achieved.

6.2 Haul-Road Improvements

Where major haul-road improvements are needed the waste management authority should pay for the initial capital costs and the municipality for maintenance.

6.3 Control of Waste Flow

The Waste Management authority should monitor the distribution of waste from source to disposal site. This should be done in such a way as to minimize overall haul and transportation costs for collection vehicles. Transfer station to change to large haulers can be used to achieve the desired distribution at disposal sites. The impact of excessive garbage vehicle flows through specific communities should also be considered.

7.0 Economic Strategies

Many economic strategies have been suggested and may eventually be developed but the underlying principles are:

7.1 Economy

As in any other public cooperative enterprise, solid waste management must be careful about expenditure of public monies. Once acceptable parameters have been established from social, environmental and technical points of view, the economic costs must be kept as low as possible.

7.2 Equitability

There are several points of view on what is equitable when it comes to paying for the disposal of solid wastes.

One point of view is that if there is to be an area-wide disposal system, then everyone in the area should pay an equal rate for waste disposal.

Another point of view is that municipalities which have tied up adequate sites in the past should be allowed to continue to enjoy the fruits of their foresight.

Larger municipalities which have no way of handling their wastes within their own borders are absolutely convinced that other municipalities must provide them with waste disposal sites.

Municipalities with quiet, uncrowded rural areas are absolutely convinced that it is unfair to designate their lands as garbage dumps for other crowded urban and suburban municipalities.

There can be no plan which satisfies the antagonists in this dilemma.

In the lower mainland there are three groups of municipalities:

a) Those which are largely developed and have no space within their borders for further waste disposal sites.

b) Those which are largely developed and have agreements with other municipalities to take their wastes.

c) Those which have areas where waste disposal sites can be developed.

Some system has to be developed to arrive at a reasonable compromise between these three groups. All will have to make concessions. Equitable ways of sharing the costs will have to be devised.

Certain possibilities suggest themselves:

a) Every municipality could pay an equal rate for the waste it generates and collect the necessary funds from its residents and businesses under whatever system it wishes.

b) Municipalities could be left to make their own arrangements as best they can with other jurisdictions.

c) A solid waste management authority covering the whole area could be set up to direct the transportation and disposal of wastes, collecting its necessary funds from the municipalities on some agreed formula such as the B.C. Hospitals Regional Assessment.

d) A solid waste management authority covering the whole area could be set up to manage transfer

7.2 Equitability (cont'd)

stations and disposal sites obtaining its funds from tipping fees at the transfer stations or disposal sites.

A decision as to the most equitable way to handle the problem of costs is absolutely imperative unless the present chaotic system is to continue. The scenarios presented in Chapter VIII all contain the basic assumption that in addition to cooperating on the problem of collecting, transporting, and disposing of solid wastes under an area wide plan, the municipalities and regional districts can work out an equitable, or at least an acceptable, method of financing the system.

It is not the purpose of the Lower Mainland Refuse Project to settle the controversy. The scenarios in Chapter VIII present options. It is up to the political process to make the final decisions and choices.

CHAPTER VIII CONCEPTS OF SOLID WASTE MANAGEMENT PLANS

1.0 Introduction

The purpose of this Chapter of the Concepts Report is to describe a variety of systems that might be used to transport and dispose of the solid wastes generated and collected in the Lower Mainland area. The nine scenarios cover a wide range of possibilities. For disposal each depends in varying proportions on the only two techniques that have a proven record of success, that is landfills and thermal reduction. Adverse impacts from leachates from landfills and gas emissions from incinerators can be prevented with a reasonable degree of certainty. There is no such thing as absolute certainty.

Other techniques such as large-scale regional composting can be introduced as they can be demonstrated to be practicable. An integral part of all systems must be a sustained effort to develop resource recovery and recycling, including home composting to reduce the amount of waste.

The principles described in Chapter VII underlie all the Scenarios presented. The relative costs, where they are available, have been obtained from the Economic Strategies Report and are shown in table IV. These costs do not include costs "external" to the scenarios. As explained in Section 6.1 Chapter VI they have not been forgotten but a decision to include them would be required.

The costs are expressed in terms of the present value of the costs of acquisition, development, operation and maintenance for twenty-five years, reclamation and salvage. This total of disbursements is, in the cases where energy recovery is assumed, reduced by the present value of the energy recovered. This calculation reduces each scenario to a single comparable value which is the present value of the net costs of the scenario.

A second calculation, shown in figure VII has been made to allow expression of this single value as a cost per tonne for the scenario.

The discount rate used is an estimate of the real rate of interest, that is the difference between commercial borrowing rates of interest for public bodies and the annual rate of inflation.

In the absence of even preliminary designs (which will have to await the more detailed studies during the Implementation Stage in 1985 and 1986) the costs must be regarded as only approximate in absolute terms. In comparing similar scenarios the costs will be relatively reliable but caution is advisable when comparing completely different systems.

Neither transfer stations nor incinerators have been precisely located. This will not effect the choice of a plan because transfer stations do not occupy large areas (in the order of two hectares or five acres) and are not accompanied by severe disamenities. They can be largely unnoticeable in an industrial area. In a rural area they can readily be kept innocuous except for the traffic generated which would require close attention.

Incineration facilities do not require large areas either, being similar in size to transfer stations. They will have similar traffic impacts. The incinerator sites in the scenarios are in industrial areas chosen with a view to the likelihood of there being a demand for the energy that might be produced.

Currently operating landfills at Port Mann (Surrey) Cottonwood (Maple Ridge) Matsqui Lagoon, Minnie's Pit (Mission) and Langley should continue until completed in order to realise their potential economic benefit from the capital invested. Such continuation must include adequate operating techniques to achieve leachate and gas control.

The administration of these sites should be encompassed in the Waste Management Plan. None is estimated to last more than four years except Minnie's Pit at ten years.

The disposition of the two other existing sites at Burns Bog in Delta and Premier Street in North Vancouver, which have longer potential lives, is encompassed in the scenarios.

The potential new sites for landfills are precisely located. However, no actual investigation or preliminary design has been carried out and their areas, depths and heights remain to be determined. The concepts in this report which include an eastern landfill, all use a single new eastern landfill. Four such regional sites have been identified. Which site will have the least impact must be the subject of a careful study of social, environmental, eeconomic and engineering factors.

The facts listed after each scenario are intended to be just that. Risk assessments have not been made for dangers of water pollution, air pollution or inadequate operation. Neither have social or transportation impact assessments been estimated. It is expected that these issues will be a major part of the public discussion of this report and that some assessments can be made later in the light of publicly expressed opinions.

There is no particular significance to the order to the order in which the following scenarios are presented.

Scenario 1 - Mass Incineration*

All incinerable waste is transported to a 3,000 tonne per day MBG incinerator at Annacis Island where it is burned. The residue or ash is taken to the Burns Bog landfill. Non-incinerable wastes are taken directly to that same landfill. Transfer stations are located in Matsqui, Langley, Maple Ridge and North Vancouver. Figure III illustrates the general locations.

CAPITAL COST	$310,000,000
SITE LIFE (YEARS)	150
ENGERY SALE POTENTIAL	Substantial
NUMBER OF MUNICIPALITIES SHARING DISPOSAL RESPONSIBILITY	One

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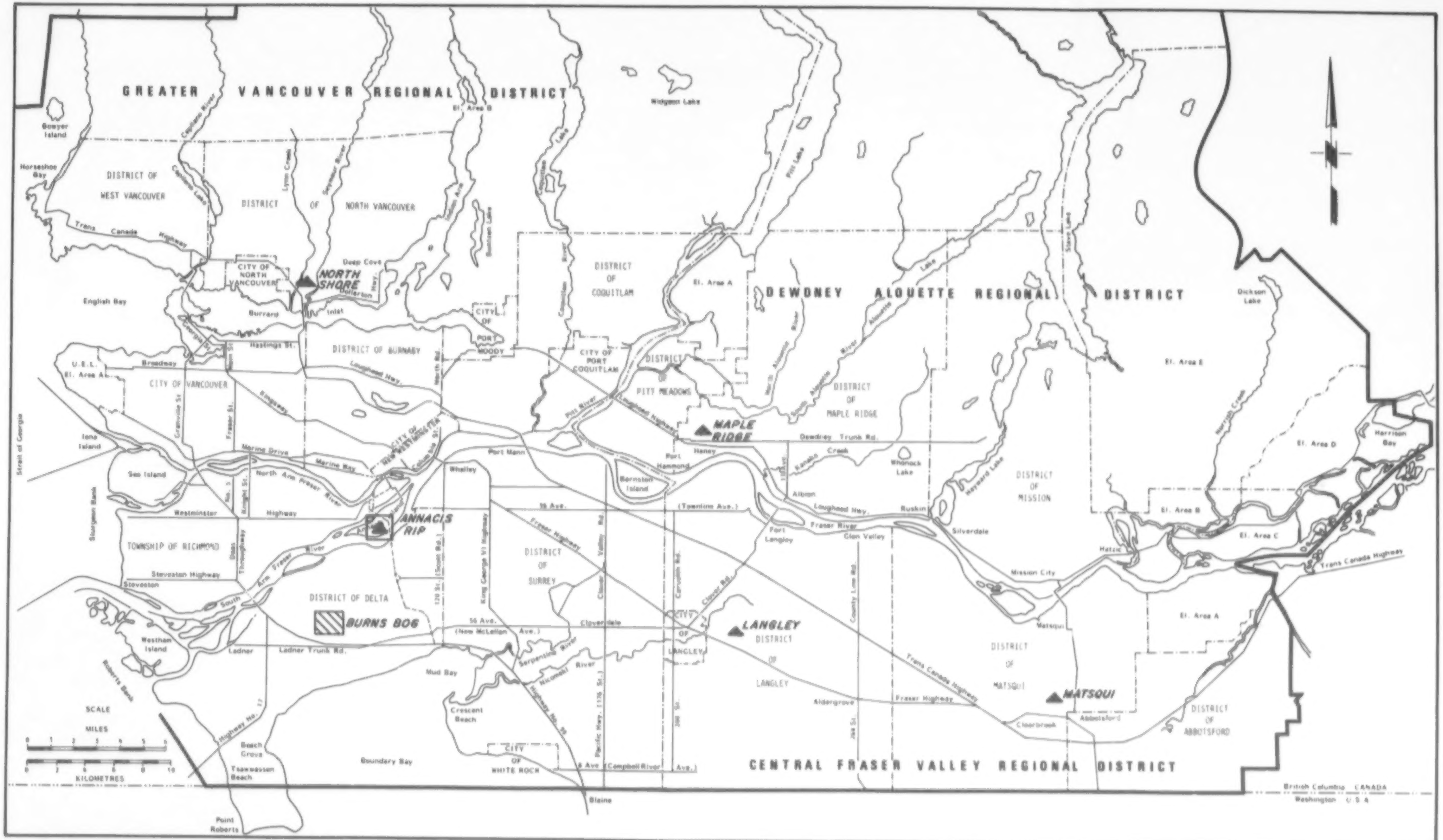
* This is Scenario S1 in the Economic Strategies Report.



GREATER VANCOUVER REGIONAL DISTRICT
DEWDNEY ALOUETTE REGIONAL DISTRICT
CENTRAL FRASER VALLEY REGIONAL DISTRICT
N
Bowyer Island
Horseshoe Bay
DISTRICT OF WEST VANCOUVER
DISTRICT OF NORTH VANCOUVER
CITY OF NORTH VANCOUVER
NORTH SHORE
Deep Cove
Capilano River
Capilano Lake
Lynn Creek
Seymour River
Indian Arm
Buntzen Lake
El. Area B
Widgeon Lake
Coquitlam Lake
Pitt Lake
Trans Canada Highway
English Bay
Burrard Inlet
Dollarton Hwy.
Hastings St.
Broadway
U.E.L.
El. Area A
CITY OF VANCOUVER
DISTRICT OF BURNABY
Lougheed Hwy.
Kingsway
CITY OF PORT MOODY
DISTRICT OF COQUITLAM
CITY OF PORT COQUITLAM
DISTRICT OF PITT MEADOWS
El. Area A
DISTRICT OF MAPLE RIDGE
MAPLE RIDGE
Dewdney Trunk Rd.
Port Hammond
Haney
Kanaka Creek
Whonnock Lake
Alouette Lake
Alouette River
Stave Lake
Dickson Lake
El. Area E
El. Area D
Harrison Bay
El. Area B
El. Area C
Hatzic
DISTRICT OF MISSION
Mission City
Silverdale
Ruskin
Hayward Lake
Trans Canada Highway
Strait of Georgia
Iona Island
Sea Island
Marine Drive
Marine Way
CITY OF NEW WESTMINSTER
Port Mann
Whalley
Barnston Island
Albion
Lougheed Hwy.
Fraser River
Glen Valley
Fort Langley
North Arm Fraser River
Westminster Highway
Sturgeon Bank
TOWNSHIP OF RICHMOND
Steveston Highway
Steveston
ANNACIS RIP
96 Ave.
(Townline Ave.)
Fraser Highway
DISTRICT OF SURREY
King George VI Highway
DISTRICT OF DELTA
BURNS BOG
56 Ave.
(New McLellan Ave.)
Cloverdale
CITY OF LANGLEY
LANGLEY
DISTRICT OF LANGLEY
Westham Island
Ladner
Ladner Trunk Rd.
Mud Bay
Serpentine River
Nicomekl River
Roberts Bank
Crescent Beach
Highway No. 17
Highway No. 99
Pacific Hwy. (176 St.)
Beach Grove
Tsawwassen Beach
Boundary Bay
CITY OF WHITE ROCK
8 Ave (Campbell River Ave.)
Blaine
Point Roberts
Aldergrove
Fraser Highway
County Line Rd.
DISTRICT OF MATSQUI
MATSQUI
Matsqui
Clearbrook
Abbotsford
DISTRICT OF ABBOTSFORD
El. Area A
SCALE
MILES
0 1 2 3 4 5 6
0 2 4 6 8 10
KILOMETRES
British Columbia CANADA
Washington U.S.A.

Legend

▨ Landfill

▲ Transfer Station

⊡ Incinerator

Figure III

MASS INCINERATION

CENTRAL LANDFILL

Scenario 2 - Central Landfill*

All waste is transported to a single landfill at Burns Bog. Transfer stations are located in Maple Ridge, Langley, North Vancouver, Coquitlam and Matsqui. Figure IV illustrates the general locations.

CAPITAL COST	$31,000,000
SITE LIFE (YEARS)	45
ENGERY SALE POTENTIAL	Some Gas Use
NUMBER OF MUNICIPALITIES SHARING DISPOSAL RESPONSIBILITY	One

* This is Scenario S2 in the Economic Strategies Report.

SCENARIO 3 - Modular Incineration Plants.

(Combined with MBG plants at Belkin and onthe North Shore)

Wastes are transported from approprite designted areas to MBG incinerators located at the Bilkin plant in Burnaby and at a site in North Vancouver. There they are burned and the residue or ash is transported to the Burns Bog landfill. In the outlying regions, three modular incineration plants are located in Matsqui, Maple Ridge and Langley.

The waste is transported to these stations and burned and the residue transported to Burns Bog. A transfer station is operated at Coquitlam from where waste is transported to Burns Bog. Burns Bog accepts waste by direct haul from Vancouver as well.

SCENARIO 3 - Modular Incineration Plants (Plus Belkin & one in North Vancouver).*

CAPITAL COST	$147,000,000
SITE LIFE (YEARS)	65
SALE ENGERY POTENTIAL	Moderate to good
NUMBER OF MUNICIPALITIES SHARING DISPOSAL RESPONSIBILITY	One for disposal, five for incineration

* This is Scenario S4 in the Economic Strategies Report.

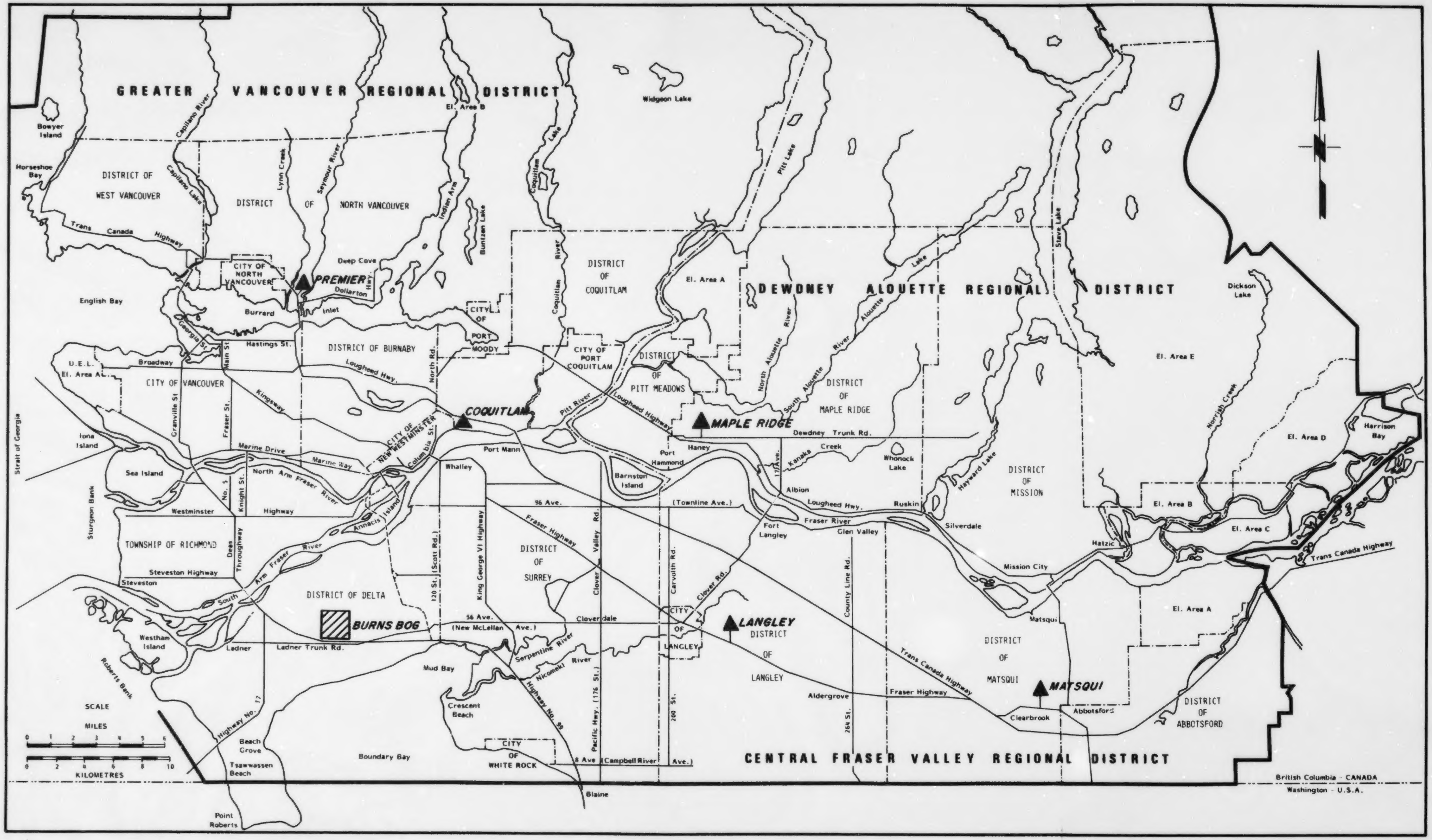

GREATER VANCOUVER REGIONAL DISTRICT
DEWDNEY ALOUETTE REGIONAL DISTRICT
CENTRAL FRASER VALLEY REGIONAL DISTRICT
DISTRICT OF WEST VANCOUVER
DISTRICT OF NORTH VANCOUVER
CITY OF NORTH VANCOUVER
PREMIER
DISTRICT OF BURNABY
CITY OF VANCOUVER
CITY OF NEW WESTMINSTER
COQUITLAM
DISTRICT OF COQUITLAM
CITY OF PORT MOODY
CITY OF PORT COQUITLAM
DISTRICT OF PITT MEADOWS
MAPLE RIDGE
DISTRICT OF MAPLE RIDGE
DISTRICT OF MISSION
TOWNSHIP OF RICHMOND
DISTRICT OF DELTA
BURNS BOG
DISTRICT OF SURREY
CITY OF LANGLEY
LANGLEY
DISTRICT OF LANGLEY
DISTRICT OF MATSQUI
MATSQUI
DISTRICT OF ABBOTSFORD
CITY OF WHITE ROCK
SCALE
MILES
KILOMETRES
British Columbia - CANADA
Washington - U.S.A.

Figure IV

CENTRAL LANDFILL

Legend

LANDFILL	▨
TRANSFER STATION	▲

SCENARIO 4 - Decentralized Landfills*

Major landfills are operated at Burns Bog and at one of the four sites in Langley or Matsqui. The Premier Street landfill in North Vancouver is extended and continues in operation until full at which time a transfer station would be constructed there. The Maple Ridge (PVI) site is also operated. The waste is either hauled direct to the landfills or via transfer stations located in Coquitlam (Braid Street) and Matsqui (Industrial Park). Landfills at the County Line site and Matsqui Gravel require an additional transfer station at Port Mann in Surrey, Figure V illustrates the general locations.

SCENARIO 4 - Decentralized Landfills*

CAPITAL COST	$31,000,000 to 42,000,000
SITE LIFE (YEARS)	Burns Bog - 55 to 60 Premier St. - 10 to 12 PVI - 45 Langley Sites: Langley Peat - 35 Country Line - 25 Matsqui Gravel - 30 Border Gravel - 20
ENERGY SALE POTENTIAL	Some Gas Use
NUMBER OF MUNICIPALITIES SHARING DISPOSAL RESPONSIBILITY	Three or four

* This is Scenario M/1 A to D in the Economic Strategies Report.

SCENARIO 5 - Decentralized Landfills (Premier Street closed)*

Landfill sites at Burns Bog, Langley and Maple Ridge (PVI accept wastes either by direct haul or via transfer stations in Coquitlam, Matsqui and North Vancouver. As in Scenario 4, use of the eastern sites at County Line or Matsqui Gravel require an additional transfer station at Port Mann in Surrey. This scenario is very much the same as Scenario 4 except that the Premier Street landfill is closed from the start.

CAPITAL COST	$31,000,000 to 42,000,000
SITE LIFE (YEARS)	150
ENERGY SALE POTENTIAL	Substantial
NUMBER OF MUNICIPALITIES SHARING DISPOSAL RESPONSIBILITY	One

* This is Scenario M2 A to D in the Economic Strategies Report.

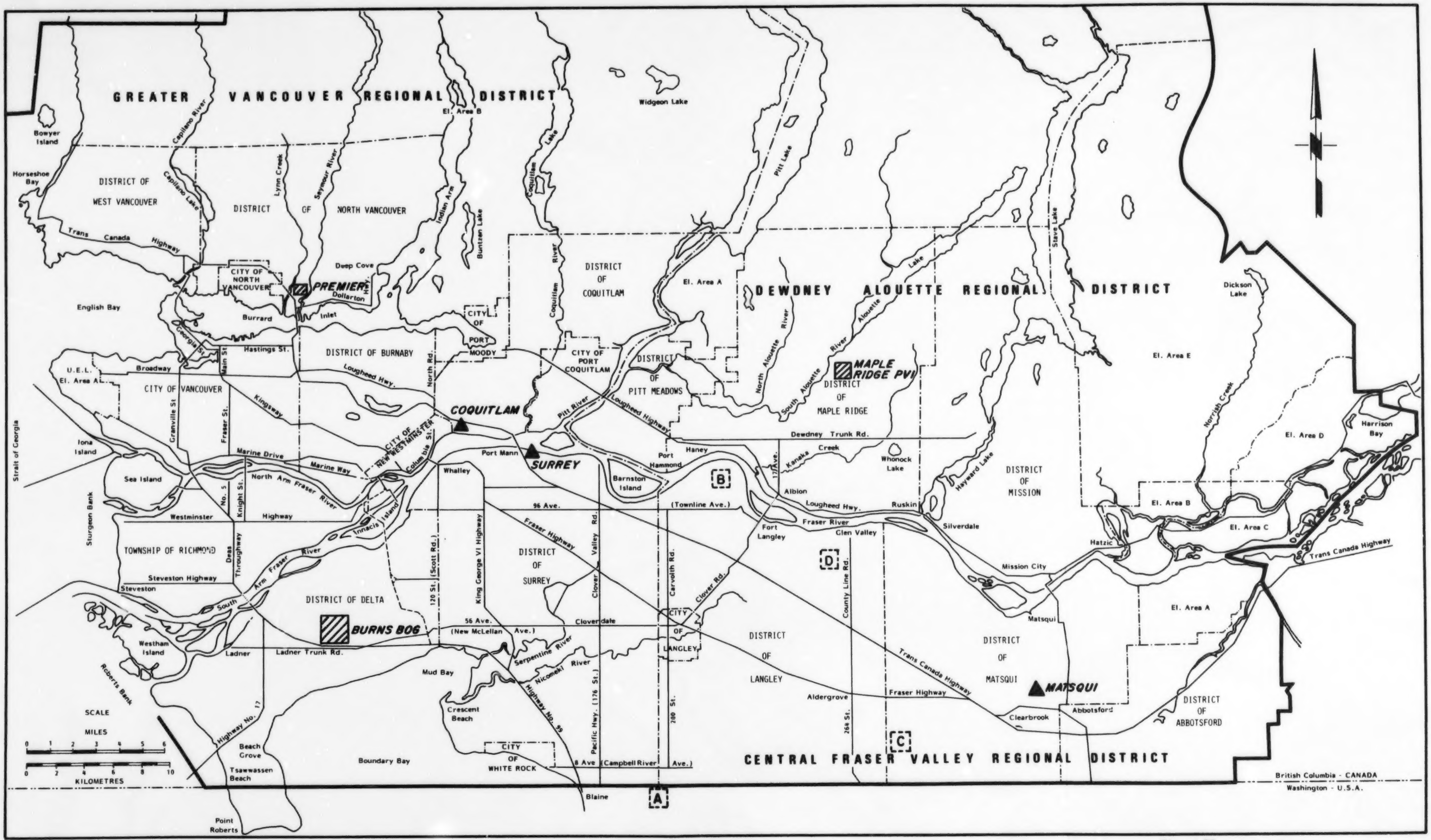

GREATER VANCOUVER REGIONAL DISTRICT
DEWDNEY ALOUETTE REGIONAL DISTRICT
CENTRAL FRASER VALLEY REGIONAL DISTRICT
N
Widgeon Lake
El. Area B
Bowyer Island
Horseshoe Bay
DISTRICT OF WEST VANCOUVER
Capilano River
Capilano Lake
DISTRICT OF NORTH VANCOUVER
Lynn Creek
Seymour River
Indian Arm
Buntzen Lake
Coquitlam Lake
Coquitlam River
Pitt Lake
Stave Lake
Alouette Lake
Trans Canada Highway
Deep Cove
CITY OF NORTH VANCOUVER
PREMIER
Dollarton Hwy.
English Bay
Burrard Inlet
Georgia St.
Hastings St.
DISTRICT OF BURNABY
Lougheed Hwy.
North Rd.
CITY OF PORT MOODY
DISTRICT OF COQUITLAM
CITY OF PORT COQUITLAM
DISTRICT OF PITT MEADOWS
El. Area A
North Alouette River
South Alouette River
Alouette River
MAPLE RIDGE PVI
DISTRICT OF MAPLE RIDGE
Dickson Lake
El. Area E
Norrish Creek
El. Area D
Harrison Bay
U.E.L. El. Area A
Broadway
Main St.
CITY OF VANCOUVER
Granville St.
Fraser St.
Kingsway
COQUITLAM
CITY OF NEW WESTMINSTER
Columbia St.
Pitt River
Lougheed Highway
Dewdney Trunk Rd.
Haney
Kanaka Creek
Whonock Lake
Hayward Lake
DISTRICT OF MISSION
Strait of Georgia
Iona Island
Sea Island
Marine Drive
Marine Way
North Arm Fraser River
Port Mann
SURREY
Whalley
Barnston Island
Port Hammond
B
17 Ave.
Albion
Ruskin
El. Area B
El. Area C
Sturgeon Bank
No. 5
Knight St.
Westminster Highway
96 Ave.
(Townline Ave.)
Lougheed Hwy.
Fraser River
Glen Valley
Fort Langley
Silverdale
Hatzic
Annacis Island
Fraser Highway
Valley Rd.
Clover
TOWNSHIP OF RICHMOND
Deas Throughway
Fraser River
120 St. (Scott Rd.)
King George VI Highway
DISTRICT OF SURREY
Carvolth Rd.
Clover Rd.
D
County Line Rd.
Mission City
Trans Canada Highway
Steveston Highway
Steveston
South Arm Fraser River
DISTRICT OF DELTA
El. Area A
BURNS BOG
56 Ave. (New McLellan Ave.)
Cloverdale
CITY OF LANGLEY
DISTRICT OF LANGLEY
Matsqui
DISTRICT OF MATSQUI
Westham Island
Ladner
Ladner Trunk Rd.
Serpentine River
Nicomekl River
Trans Canada Highway
Roberts Bank
Mud Bay
Highway No. 99
Pacific Hwy. (176 St.)
200 St.
264 St.
Aldergrove
Fraser Highway
MATSQUI
Clearbrook
Abbotsford
DISTRICT OF ABBOTSFORD
SCALE
MILES
0 1 2 3 4 5 6
0 2 4 6 8 10
KILOMETRES
Highway No. 17
Beach Grove
Tsawwassen Beach
Boundary Bay
Crescent Beach
CITY OF WHITE ROCK
8 Ave (Campbell River Ave.)
C
British Columbia - CANADA
Washington - U.S.A.
Blaine
A
Point Roberts

Figure V

Legend

LANDFILL ▨ [A]

TRANSFER STATION ▲

DECENTRALIZED LANDFILLS

SCENARIO 6 - Decentralized Landfills - Incineration (Belkin)

Wastes are taken to landfills at Burns Bog, Langley, Premier Street and Maple Ridge (PVI), either by direct haul or via transfer stations. In addition a 140,000 tonnes per year MBG incinerator is operated at the Belkin Paperboard Plant in Burnaby. Transfer stations are located in Matsqui, Surrey and Coquitlam and when the Premier Street landfill is completed it would be replaced by a further transfer station. Figure VI illustrates the locations.

SCENARIO 6 - Decentralized Landfills - Incineration (Belkin)*

CAPITAL COST	$78,000,000 to 81,000,000
SITE LIFE (YEARS)	Burns Bog - 60 to 70 PVI - 45 Premier St - 10 to 12 Langley Sites: Langley Peat - 45 County Line - 30 Matsqui Gravel - 35 Border Gravel - 30
ENERGY SALE POTENTIAL	Moderate; some gas use
NUMBER OF MUNICIPALITIES SHARING DISPOSAL RESONSIBILITY	Three or four for disposal, one for incineration

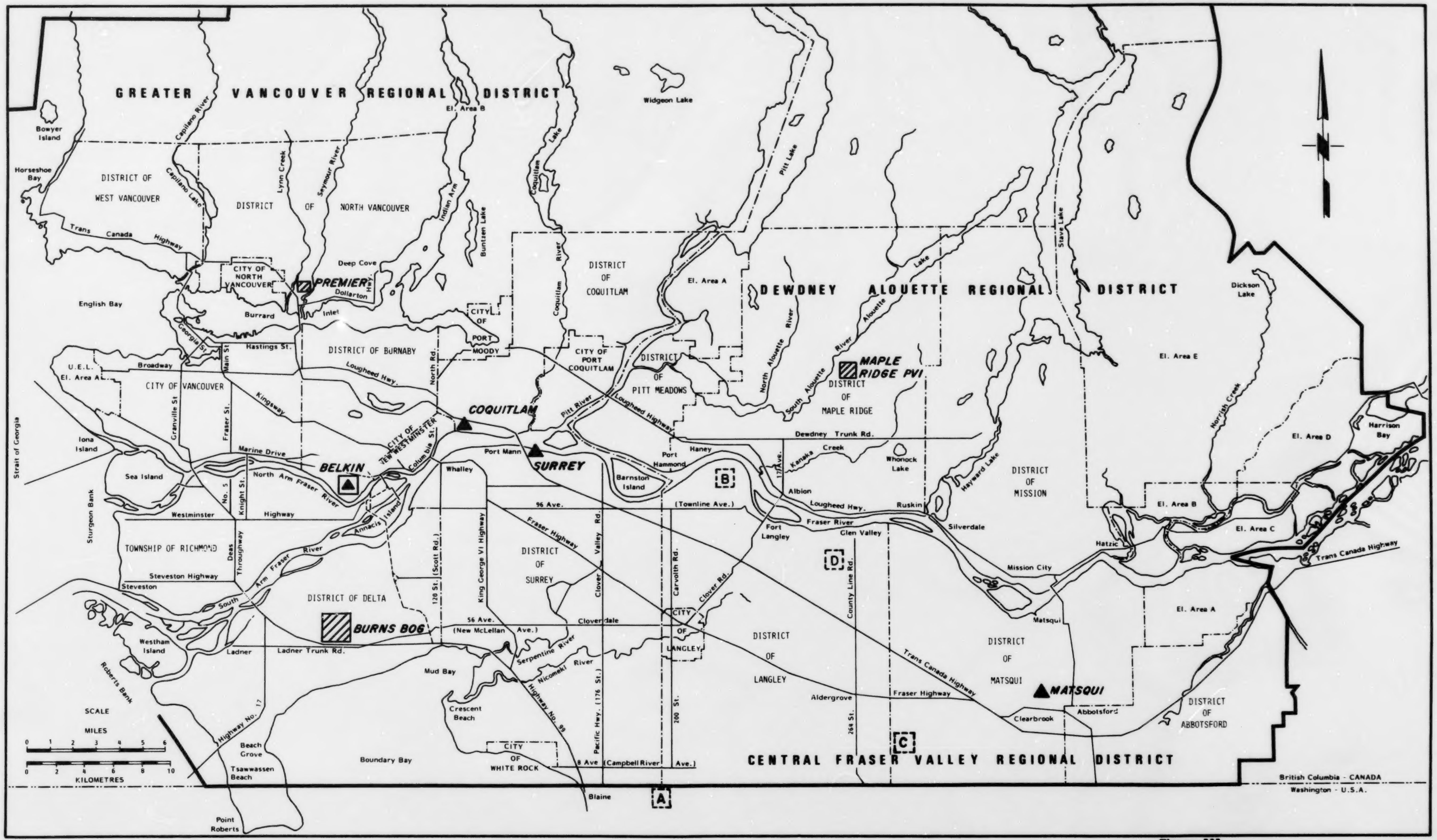
* This is Scenario M3 A to D in the Economic Strategies Report.

SCENARIO 7 - Decentralized Landfills - Incineration (Belkin) (Premier Street Closed)*

This scenario is the same as Scenario 6 except that the Premier Street Landfill is closed from the start.

CAPITAL COST	$77,000,000 to 81,000,000
SITE LIFE (YEARS)	Burns Bog - 50 to 60 PVI to 45 Langley Sites: Langley Peat - 45 County Line - 30 Matsqui Gravel - 35 Border Gravel - 25
ENERGY SALE POTENTIAL	Moderate; some gas use
NUMBER OF MUNICIPALITIES SHARING DISPOSAL RESPONSIBILITY	Three for disposal, one for incineration

* This is Scenarios M4 A to D in the Economic Strategies Report.


GREATER VANCOUVER REGIONAL DISTRICT
DEWDNEY ALOUETTE REGIONAL DISTRICT
CENTRAL FRASER VALLEY REGIONAL DISTRICT
DISTRICT OF WEST VANCOUVER
DISTRICT OF NORTH VANCOUVER
CITY OF NORTH VANCOUVER
CITY OF VANCOUVER
DISTRICT OF BURNABY
CITY OF PORT MOODY
DISTRICT OF COQUITLAM
CITY OF PORT COQUITLAM
DISTRICT OF PITT MEADOWS
DISTRICT OF MAPLE RIDGE
DISTRICT OF MISSION
CITY OF NEW WESTMINSTER
TOWNSHIP OF RICHMOND
DISTRICT OF DELTA
DISTRICT OF SURREY
CITY OF LANGLEY
DISTRICT OF LANGLEY
DISTRICT OF MATSQUI
DISTRICT OF ABBOTSFORD
CITY OF WHITE ROCK
El. Area A
El. Area B
El. Area C
El. Area D
El. Area E
U.E.L. El. Area A
PREMIER
BELKIN
COQUITLAM
SURREY
BURNS BOG
MAPLE RIDGE PVI
MATSQUI
A
B
C
D
Bowyer Island
Horseshoe Bay
English Bay
Burrard Inlet
Deep Cove
Dollarton Hwy
Capilano River
Capilano Lake
Lynn Creek
Seymour River
Indian Arm
Buntzen Lake
Coquitlam Lake
Coquitlam River
Widgeon Lake
Pitt Lake
Pitt River
Alouette Lake
Alouette River
North Alouette River
South Alouette River
Stave Lake
Dickson Lake
Norrish Creek
Harrison Bay
Hayward Lake
Whonock Lake
Kanaka Creek
Strait of Georgia
Sturgeon Bank
Roberts Bank
Iona Island
Sea Island
Westham Island
Annacis Island
Barnston Island
Mud Bay
Boundary Bay
Crescent Beach
Beach Grove
Tsawwassen Beach
Point Roberts
Trans Canada Highway
Georgia St.
Hastings St.
Broadway
Main St.
Granville St.
Fraser St.
Kingsway
Marine Drive
Knight St.
No. 5
Westminster Highway
Steveston Highway
Deas Throughway
Lougheed Hwy.
North Rd.
Columbia St.
Lougheed Highway
Dewdney Trunk Rd.
North Arm Fraser River
South Arm Fraser River
Fraser River
Fraser Highway
Whalley
Port Mann
Port Hammond
Haney
Albion
Fort Langley
Glen Valley
Ruskin
Silverdale
Mission City
Hatzic
Matsqui
Abbotsford
Clearbrook
Aldergrove
Cloverdale
Ladner
Steveston
Blaine
96 Ave.
(Townline Ave.)
56 Ave.
(New McLellan Ave.)
Ladner Trunk Rd.
8 Ave (Campbell River Ave.)
120 St. (Scott Rd.)
King George VI Highway
Clover Valley Rd.
Pacific Hwy. (176 St.)
Carvolth Rd.
200 St.
Clover Rd.
County Line Rd.
264 St.
17 Ave.
Highway No. 17
Highway No. 99
Serpentine River
Nicomekl River
SCALE
MILES
0 1 2 3 4 5 6
0 2 4 6 8 10
KILOMETRES
British Columbia - CANADA
Washington - U.S.A.
N

LEGEND
LANDFILL ▨ [A]
TRANSFER STATION ▲
INCINERATOR ▲

Figure VI

DECENTRALIZED LANDFILLS
INCINERATION

SCENARIO 8 - Decentralized Landfills - Multiple Incineration Belkin Paperboard and North Vancouver*

This scenario is very similar to Scenario 7 except that the North Vancouver transfer station is replaced by an MBG incinerator of 140,000 tonnes per year capacity. This too, as with the case of the Belkin incinerator, will reduce the waste stream by some 112,000 tonnes per year leaving 28,000 tonnes of residue or ash to be transported to an eastern landfill site.

CAPITAL COST	$111,000,000 to 115,000,000
SITE LIFE	Burns Bog - 65 to 75, PVI - 45 Langley Sites: Langley Peat - 45 County Line - 30 Matsqui Gvavel - 35 Border Gravel - 25
ENERGY SALE POTENTIAL	Good; some gas use
NUMBER OF MUNICIPALITIES SHARING DISPOSAL RESPONSIBILITY	Three for disposal,two for incineration

* This is Scenario M5 A to D in the Economic Strategies Report.

SCENARIO 9 - Transport to the Interior to a Mine Site

Continental Environmental Systems Ltd., (CESL) submitted a proposal to collect all wastes at a transfer station, to compact and bale it there and load it on special covered railway cars. This material would be transported by rail to a non-operating open-pit mine site in the interior to reclaim the open pit mine through a bale-fill operation.

A site near Coleman in Alberta was suggested but the Government of Alberta's policy is to not accept wastes from outside of the province. CESL reports that they have obtained an operating agreement for another site in the interior.

SCENARIO 9 - Transport to the Interior to a Mine Site

CAPITAL COST	Unknown
SITE LIFE (YEARS)	Unknown
ENERGY SALE POTENTIAL	Doubtful
NUMBER OF MUNICIPALITIES SHARING DISPOSAL RESPONSIBILITY	None within the area

FIGURE VII - Approximate $/Tonne for Net Present Values

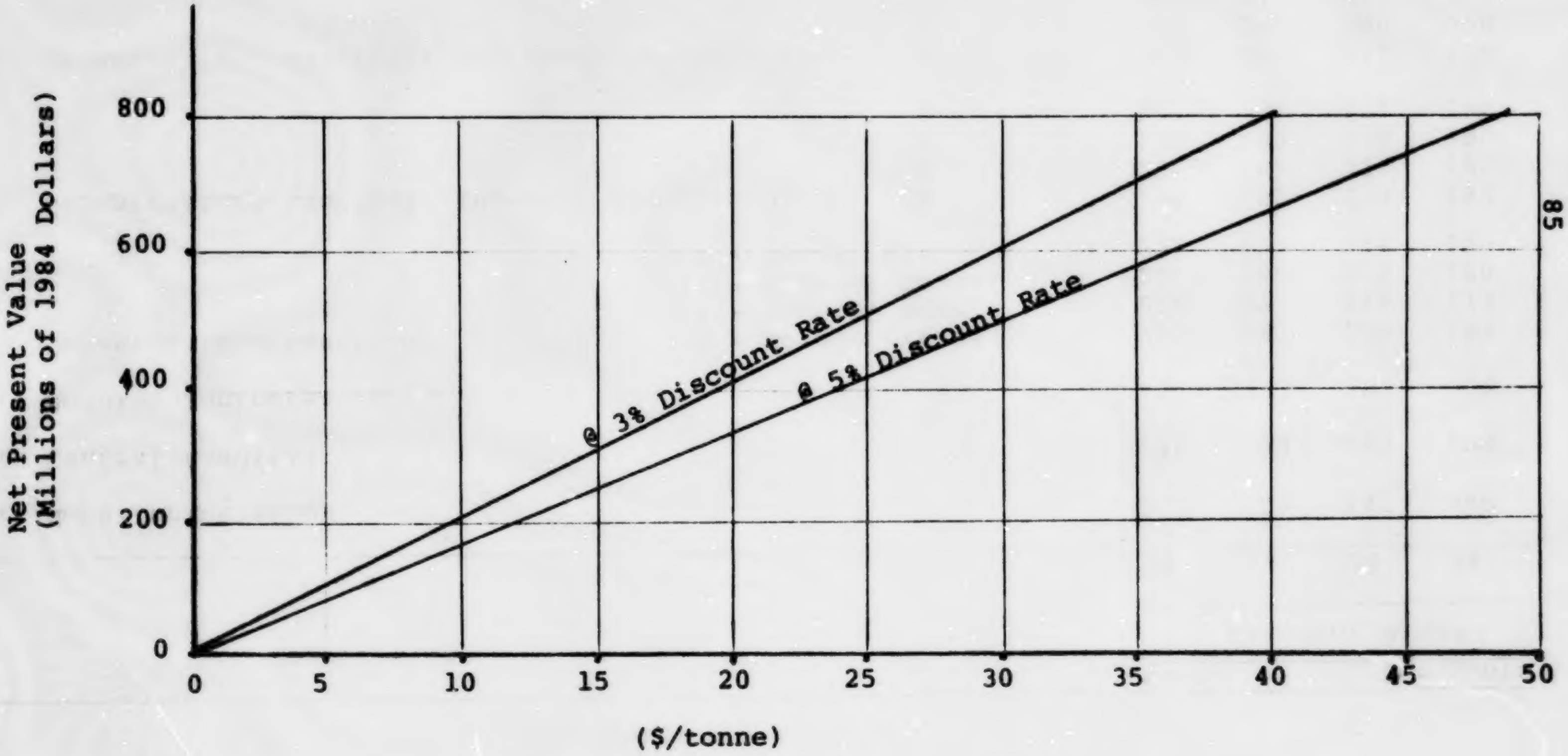


TABLE IV
Present Values - Millions of 1984 Dollars
Costs of Construction & 25 Years Operation & Energy Sales
SCENARIOS 1 to 8

Description		Costs		Net Costs	
		Discount Rate*			
		3%	5%	3%	5%
1. Mass Incineration		717	609	543	480
2. Central Landfill		249	199	249	199
3. Modular Incinerators		452	373	357	302
4. Decentralized Landfills	A - Border Gravel	229	183	229	183
	B - Langley Peat	216	173	216	173
	C - Matsqui Gravel	225	180	225	180
	D - County Line	221	177	221	177
5. Decentralized Landfills (Premier St. Closed)	A	239	192	239	192
	B	226	182	226	182
	C	235	189	235	189
	D	231	186	231	186
6. Decentralized Landfills Incineration (Belkin)	A	311	253	258	214
	B	303	247	250	208
	C	305	248	252	209
	D	302	246	249	207
7. Decentralized Landfills Incineration (Premeir St. Closed)	A	320	263	267	224
	B	312	257	259	218
	C	314	258	261	219
	D	311	255	258	216
8. Decentralized Landfills Incineration (Belkin & North Shore)	A	378	313	283	242
	B	370	308	275	237
	C	372	308	277	237
	D	369	306	274	235
9. Transport to Interior		UNKNOWN			

*Real Rate of Interest

TABLE V - Relative Comparison of Scenarios 1 to 9

	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5	SCENARIO 6	SCENARIO 7	SCENARIO 8	SCENARIO 9
	Incinerator @ Annacis Island Landfill @ Burns Bog	Landfill @ Burns Bog	Incinerators @ Belkin, N. Shore, Matsqui, Maple Ridge & Langley (Vancouver & Delta refuse unburned) Landfill @ Burns Bog	Landfills @ Burns Bog, Langley, Premier Street (until full) & PVI	Landfills @ Burns Bog, Langley & PVI	Incinerator @ Belkin Landfills @ Burns Bog, Langley, Premier Street (until full) & PVI	Incinerator @ Belkin Landfills @ Burns Bog, Langley & PVI	Incinerators @ Belkin & N. Shore Landfills @ Burns Bog, Langley & PVI	Transport To Interior Mine Site
Capital Cost (1984 $)	$310,000 000	$31,000,000	$147,000,000	$31,000,000 to $42,000,000	$31,000,000 to $42,000,000	$78,000,000 to $81,000,000	$77,000,000 to $81,000,000	$111,000,000 to $115,000,000	Unknown
Net Present Value (1984 $)	$480,000,000 to $717,000,000	$199,000,000 to $249,000,000	$302,000,000 to $452,000,000	$173,000,000 to $229,000,000	$182,000,000 to $239,000,000	$207,000,000 to $311,000,000	$216,000,000 to $320,000,000	$235,000,000 to $378,000,000	Unknown
Site Life of Landfills - Years (Burns Bog includes projected GVS & DD purchase)	150	45	65	Burns Bog: 55-60; either Langley Peat: 35 County Line: 25 Matsqui Gravel: 30 or Border Gravel: 20; Premier St: 10-12; PVI: 45	Burns Bog: 55-60; either Langley Peat: 35 County Line: 25 Matsqui Gravel: 30 or Border Gravel: 20; PVI: 45	Burns Bog: 60-70; either Langley Peat: 45 County Line: 30 Matsqui Gravel: 35 or Border Gravel: 25; Premier St: 10-12; PVI: 45	Burns Bog: 60-70; either Langley Peat: 45 County Line: 30 Matsqui Gravel: 35 or Border Gravel: 25; PVI: 45	Burns Bog: 60-75; either Langley Peat: 45 County Line: 30 Matsqui Gravel: 35 or Border Gravel: 25 PVI: 45	Unknown
Energy Sale Potential	Substantial	Some Gas Use	Moderate to Good	Some Gas Use	Some Gas Use	Moderate + Some Gas Use	Moderate + Some Gas Use	Good + Some Gas Use	Doubtful
Number of Municipalities Sharing Disposal Responsibility	One	One	Disposal: one Incineration: five	Three to four	Three	Disposal: three to four Incineration: one	Disposal: three Incineration: one	Disposal: three Incineration: two	None within the area

CHAPTER IX FUTURE PROGRAM

This chapter outlines what will take place during the next three months until the end of the Planning Phase on March 31, 1984. The following are the significant dates in the program:

1984

December 20 - Publication of the Concepts Report

1985

January 15,16, 17,18 - Open houses on Concepts Report

January 26 - Conference on the Concepts Report.

At this point a Draft Solid Waste Management Plan (SWMP) will be prepared and presented first to the Management Committee and then to the Political Steering Committee. When this has been completed the Draft SWMP will be published and open houses and a conference held. This will be completed about March 2 after which the Recommended SWMP will be prepared for transmittal to the PSC and the Minister. Times and places for the various events will be published separately.

As indicated elsewhere in this report the most usefuly forms of submission are those in writing, either briefs or even letters. A number of organizations which present briefs will be invited to attend the conferences and speak to those briefs. These short presentations will occupy the morning of the conference. In the afternoon the speakers and other invitees to the conference will divide into small groups to discuss a set of pre-chosen subjects. A final plenary session will attempt to synthesize or at least display the results of the small-group discussions.

The conferences will be open to the public and press. However, only those invited will be able to particpate in the discussions.

The program that will be followed during the Implementation Phase after April 1, 1984 will be determined by the Political-Steering Committee.

APPENDICES

APPENDIX A: Names and affiliations of all committee members.

Political Steering Committee

The Hon. Anthony J. Brummet, Chairman, Minister of Environment

Mayor D. Ross,	District of Surrey, Greater Vancouver Regional District Board Chairman
Mayor H. Agnew,	District of Mission, Central Fraser Valley Regional District Board Chairman
Mayor J. DeJong,	District of Matsqui, Dewdney-Alouette Regional District Board Chairman
Mayor M. Harcourt	City of Vancouver
Mayor T. Baker	City of New Westminster
Mayor J. Loucks	City of North Vancouver
Mayor L. Traboulay	City of Port Coquitlam
Mayor D. Driscoll	City of Port Moody
Mayor G. J. Hogg	City of White Rock
Mayor W. Lewarne	District of Burnaby
Mayor L. Sekora	District of Coquitlam
Mayor E. Burnett	District of Delta
Mayor M. Baker	District of North Vancouver
Mayor G. Blair	Township of Richmond
Mayor D. Humphreys	District of West Vancouver
Mayor R. H. Easingwood	City of Langley
Mayor G. Ferguson	District of Abbotsford
Mayor W. C. Blair	Township of Langley
Mayor D. Griffin	District of Maple Ridge
Mayor D. Sharpe	District of Pitt Meadows
Mr. S. McLaren	Fraser River Harbour Commission
Ald. Ann C. Hulbert	City of Port Moody

Management Committee

Mr. B. E. Marr*	Chairman, Deputy Minister of Environment
Mr. D. MacKay*	Commissioner, Greater Sewerage & Drainage District
Mr. H. Porter*	Administrator, Central Fraser Valley Regional District
Mr. N. Cook*	Administrator, Dewdney-Alouette Regional District
Mr. F. Bowers	Administrator, City of Vancouver
Mr. R. Collier	Administrator, District of Delta
Mr. J. Bremner	Municipal Engineer, District of North Vancouver
Mr. J. Godfrey	Administrator, Township of Langley
Mr. E. Regts	Municipal Engineer, District of Matsqui
Mr. G. Harkness	Assistant Deputy Minister, Ministry of Municipal Affairs
Mr. H. Harnett	Administrator, District of Mission
Mr. J. Sulina	Administrator, District of Maple Ridge
Mr. M. Jones	Administrator, District of Surrey

*Management Committee Executive.

Technical Committee

Mr. K. Henry, Chairman	Lower Mainland Refuse Project
Mr. J. Bremner	District of North Vancouver
Mr. W. Brydon	B.C. Public Interest Research Group
Mr. F. Claggett	Environmental Protection Service
Mr. P. Connolly	District of Mission
Mr. J. E. Dew-Jones	B.C. Ministry of Environment Waste Management
Ms. E. Feller	Society Promoting Environmental Conservation
Mr. J. Hamilton	District of Delta
Mr. P. Khare	B.C. Ministry of Environment Waste Mangement
Mr. W. Kyle	District of Surrey
Mr. W. Lakevold	District of Langley
Mr. W. Mechler	Greater Vancouver Sewer & Drainage District
Mr. N. Nyberg	District of Coquitlam
Mr. F. Peters	City of Port Coquitlam
Mr. A. Purdon	Greater Vancouver Sewer & Drainage District
Mr. E. Regts	District of Matsqui
Mr. D. Rudberg	City of Vancouver
Mr. R. Smith	B.C. Ministry of Health
Mr. D. Walker	District of West Vancouver

Working Committees

Economic Strategies

Mr. N. Nyberg, Chairman	District of Coquitlam
Mr. T. Allis	Greater Vancouver Sewer & Drainage District
Mr. G. Bridges	B.C. Ministry of Environment Assessment & Planning Branch
Mr. P. Connolly	District of Mission
Mr. R. Hennick	Green Party
Mr. R. McCarthy	Recycling Council of B.C.
Mr. G. Nass	Smithrite Disposal Ltd.
Mr. A. Phillips	City of Vancouver
Mr. A. Tamblin	B.C. Ministry of Municipal Affairs
Mr. M. Wong	B.C. Ministry of Environment Waste Management
Mr. C. Zeiss	Private Citizen

Gypsum Disposal

Mr. D. Rudberg, Chairman	City of Vancouver
Mr. R. Dolphin	District of Surrey
Mr. J. Hamilton	District of Delta
Mr. L. Hayton	Greater Vancouver Sewer & Drainage District
Mr. R. Pearce	Fraser River Harbour Commission
Dr. J. Ward	B.C. Ministry of Environment Waste Management Branch
Mr. M. Wong	B.C. Ministry of Environment Waste Management

Working Committees (cont'd.)

Landfills

Mr. J. Bremner, Chairman	District of North Vancouver
Mr. B. Cox	B.C. Ministry of Environment, Fish & Wildlife Management
Mr. J. Hamilton	District of Delta
Mr. L. Hayton	Greater Vancouver Sewer & Drainage District
Mr. A. Kohut	B.C. Ministry of Environment Water Management Branch
Mr. W. Lakevold	District of Langley
Mr. E. Lawson	B.C. Ministry of Environment Waste Management
Mr. U. Ottho	Don't Dump On Delta
Mr. A. Purdon	Greater Vancouver Sewer & Drainage District
Mr. E. Regts	District of Matsqui
Mr. D. Rudberg	City of Vancouver
Mr. R. Shepherd	Environmental Protection Service
U Tin Tun	B.C. Ministry of Environment Public Health Engineering
Mr. J. Wiens	B.C. Ministry of Environment Surveys & Resource Mapping
Mr. T. Wood	B.C. Ministry of Environment Fish & Wildlife Management

Maple Ridge Special Task Force

Mr. D. Walker, Chairman	District of West Vancouver
Mr. P. Connolly	District of Mission
Mr. T. Gardner	District of Maple Ridge
Mr. R. Greene	District of Pitt Meadows
Mr. L. Hayton	Greater Vancouver Sewer & Drainage District

Working Committees (cont'd.)

Incinerator Emmissions

Mr. Prad Khare, Chairman	B.C. Ministry of Environment Waste Management
Dr. K. K. Bhattacharyya	B.C. Ministry of Environment Waste Management
Mr. M. Mennell	Greater Vancouver Regional District
Mr. E. Wituschek	Environmental Protection Service

Public Interface

Mr. K. Henry, Chairman	Lower Mainland Refuse Project
Mr. D. Connor	Connor Development Services Ltd.
Mr. J. E. Dew-Jones	B.C. Ministry of Environment Waste Management
Mr. T. Jones	B.C. Ministry of Environment Information Services
Mr. M. Shelley	District of Burnaby
Ms. A. Svendsen	Connor Development Services Ltd.

Resource Recovery & Recycling

Mr. F. Peters, Chairman	City of Port Coquitlam
Mr. D. Douglas	B.C. Ministry of Environment Waste Management
Mr. W. Filiatrault	Community Paper Recycling Ltd.
Mr. P. Herring	City of Vancouver
Mr. J. Kingdon	Greater Vancouver Sewer & Drainage District
Mr. D. Koehn	Ridge Meadows Recycling
Mr. G. Koldyck	Pacific Metals Ltd.
Mr. J. Richards	Abbotsford-Matsqui Community Services
Mr. B. Smith	Greater Vancouver Sewer & Drainage District
Mr. D. Walker	District of West Vancouver
Mr. M. Wong	B.C. Ministry of Environment Waste Management
Mr. J. Yip	City of New Westminster

Working Committees (Cont'd)

Richmond Special Task Force

Mr. J. Hamilton, Chairman	District of Delta
Mr. L. Hayton	Greater Vancouver Sewer & Drainage District
Mr. E. Lawson	B.C. Ministry of Environment Waste Management
Mr. D. Rudberg	City of Vancouver
Mr. R. Shepherd	Environmental Protection Service

Surrey-Matsqui Special Task Force

Mr. D. Walker, Chairman	District of West Vancouver
Mr. P. Herring	City of Vancouver
Mr. W. Kyle	District of Surrey
Mr. A. Purdon	Greater Vancouver Sewer & Drainage District
Mr. E. Regts	District of Matsqui

Thermal Reduction Committee

Mr. W. Mechler, Chairman	Greater Vancouver Sewer & Drainage District
Mr. W. Brydon	B.C. Public Interest Research Group
Mr. D. Douglas	B.C. Ministry of Environment Waste Management
Mr. T. Gardner	District of Maple Ridge
Mr. J. Hamilton	District of Delta
Mr. P. Khare	B.C. Ministry of Environment Waste Management
Mr. A. Louie	Township of Richmond
Mr. D. Riecken	District of Matsqui
Mr. M. Ross	District of Burnaby
Mr. E. Wituschek	Environmental Protection Service

Working Committees (cont'd)

Transfer Stations & Transportation

Mr. P. Connolly, Chairman	District of Mission
Mr. T. Allis	Greater Vancouver Sewer & Drainage District
Mr. J. Hall	City of Vancouver
Mr. J. Nickel	District of Abbotsford
Mr. N Nyberg	District of Coquitlam
Mr. L. Remple	Laidlaw Waste Systems

APPENDIX B:

A SUMMARY OF CONCERNS

compiled by representatives of the following groups:

West Coast Environmental Law
The Society Promoting Environmental Conservation
Ridge Meadows Recycling
Recycling Council of B.C.
Green Party of Canada
Citizens Opposed to Landfill Dumping
Fort Langley C. I. S.
Surrey and Langley against Garbage

In the process of critiquing the work of the Lower Mainland Refuse Project, the representatives of the public interest groups felt it essential to develop a philosophical base. There was general accord with the following tenets:

- waste disposal is a social responsibility.
- we should not inflict environmental problems on current and future generations.
- waste production must be reduced at the manufacturing stage and by the consumer.

Rationale for the Response

The LMRP is a welcome step foward in waste management planning. Representatives of public interest groups in the project's public involvement component were initially extremely encouraged and have appreciated the support of the project manager in enabling us to produce this critique. As we have watched the project develop, our concerns about a variety of issues have increased and we feel it is necessary to publish these in conjunction with the Concepts Report.

Major General Concerns

- the research upon which the key reports were based was not adequate and out of date. e.g. the recycling report.
- the work was carried out by already over-worked staff which impeded the quality of the reports.
- the representation of some important government agencies was not satisfactory.
- the concerns of public representatives on the committees were not adequately reflected in these reports.
- a legal committee was not established to collect and examine legislation and waste management plans from other jurisdictions.

Specific Concerns

- In the landfills report the weighting of the criteria used and its application to the various sites was highly questionable. The attempt to belittle public concern about the toxicity of leachate is strongly condemned.

- In the resource recovery report the estimates of potential recycling were too low (11%),, in fact the GVRD itself is recognizing higher levels in recent publications. The report was too negative in its treatment of source seperation, household pick-up and composting.
- In the thermal reduction report, the technical information was well researched and presented but once again there was too ready dismissal of real health dangers from incinerator emmissions.
- In the economics strategies report, only part of the readily identifiable costs were included and therefore any decisions made on the basis of this report will be faulty. We also strongly urge that the social costs be identified in the economic calculus. There is a problem with net present value calculus in that it under-rates future costs and benefits.

Recommendations for Future Waste Management Plan

The future waste management plan must be an integration of a number of methods not a single solution approach. The plan must have clearly stated goals, targets and strategies to meet these goals. For example the plan must state how much reduction of the waste stream must be achieved in a time period and what strategies will used. The plan must contain a clear statement of purposes and objectives and legal provisions to encourage re-use, reduction, recycling and resource recovery. Source seperation must be a strong component of the plan. The priorities of the plan should be:

- reduction of waste.
- diversion of hazardous and toxic materials from the waste stream.
- reuse of waste materials.
- recycling and composting.
- energy recovery where possible from materials not reusable or compostable.
- disposal of inert materials in an environmentally acceptable way.